

FIG._2

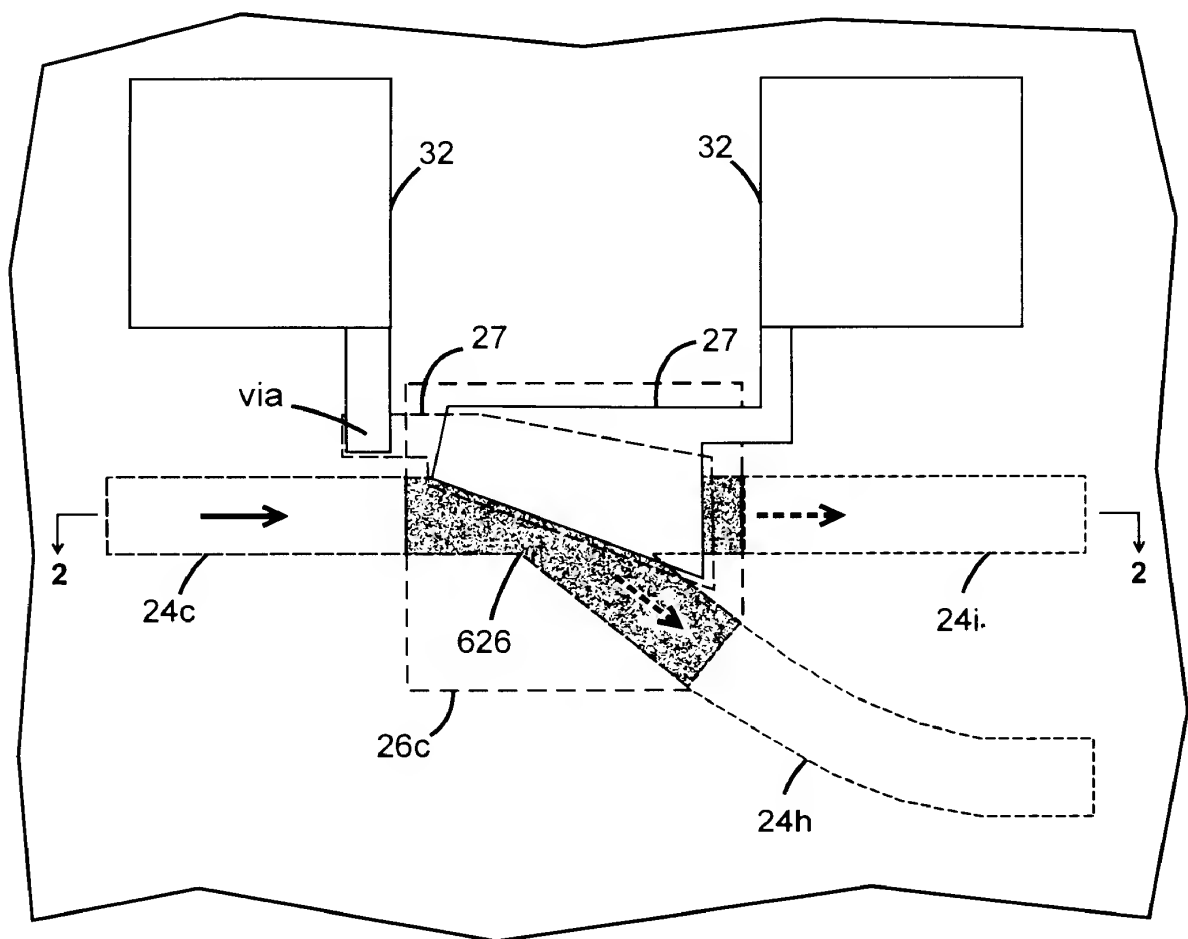


FIG._3

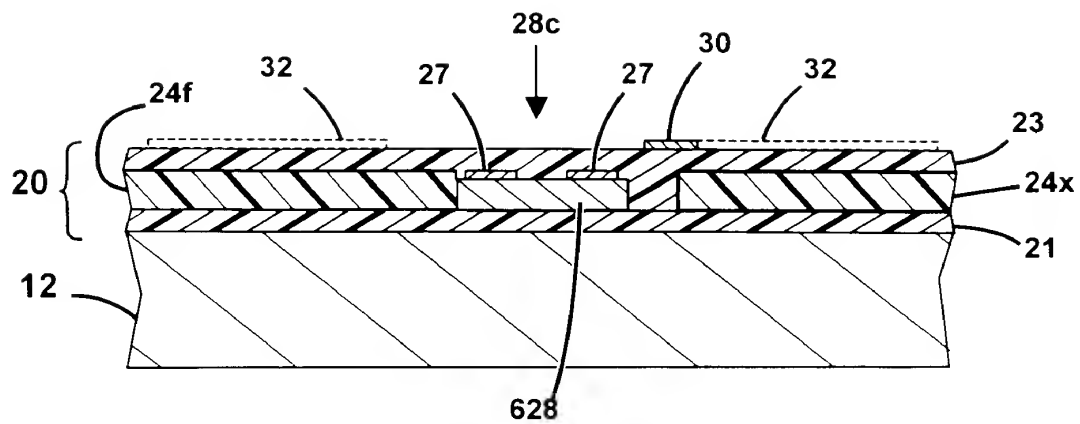


FIG._4-1

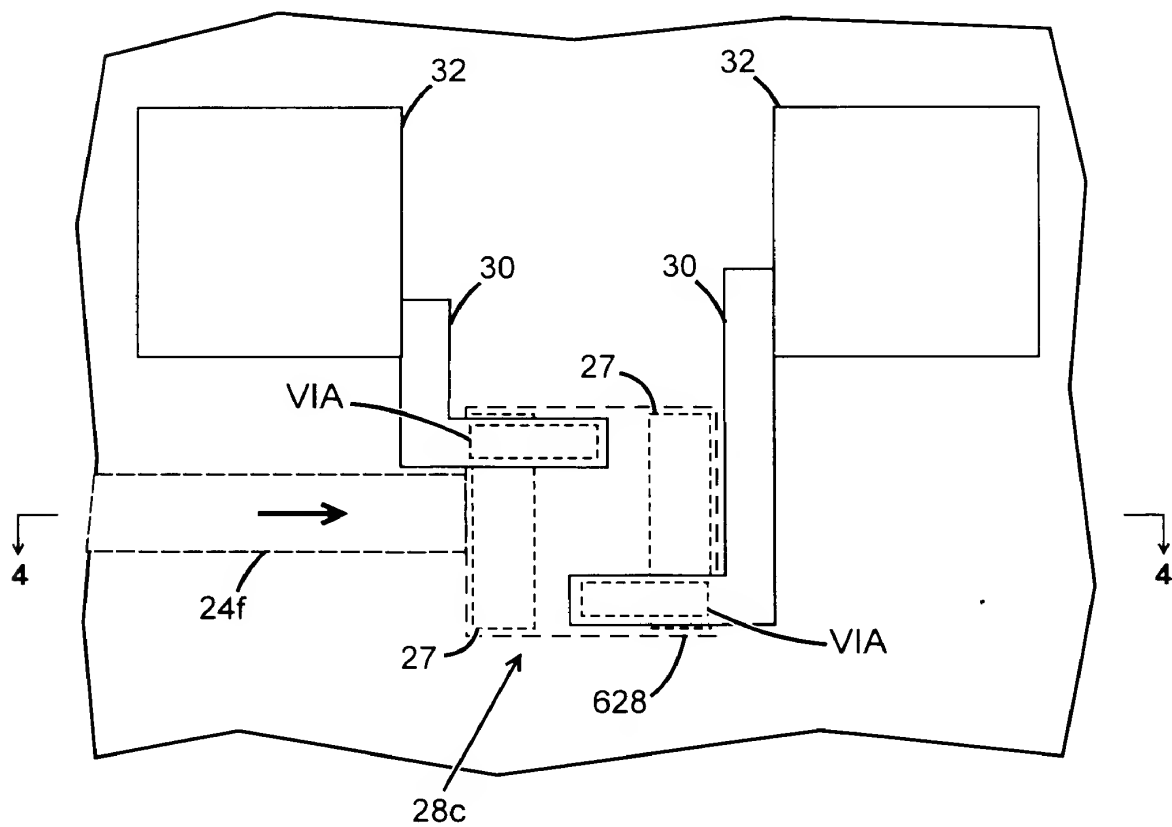
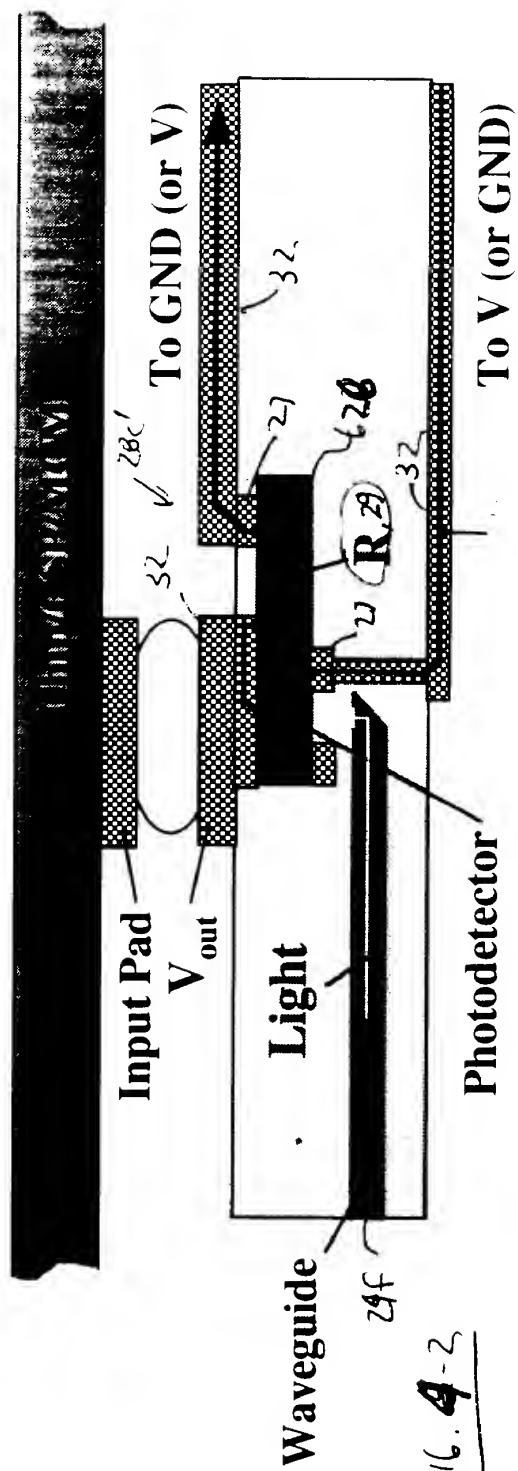
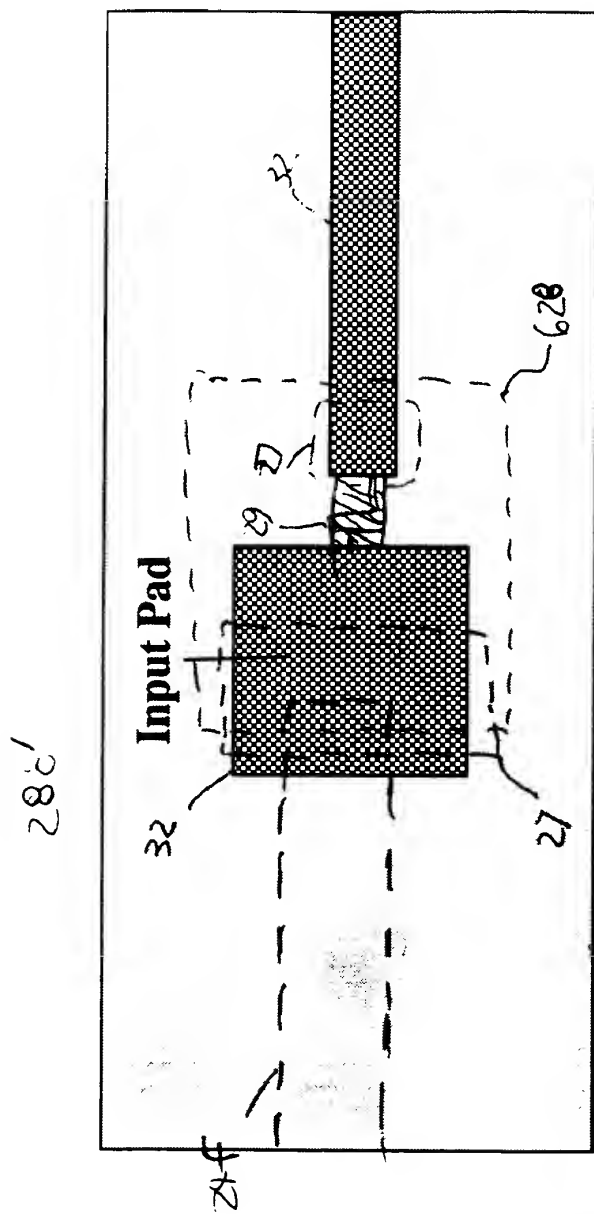


FIG._5-1



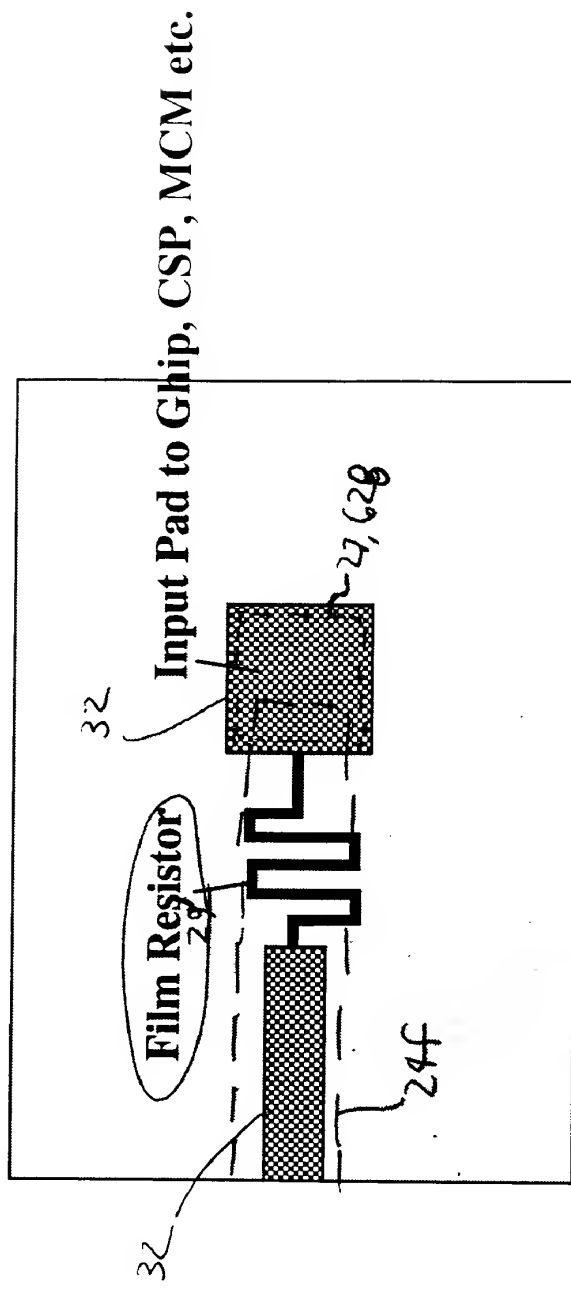


Fig. 5-3

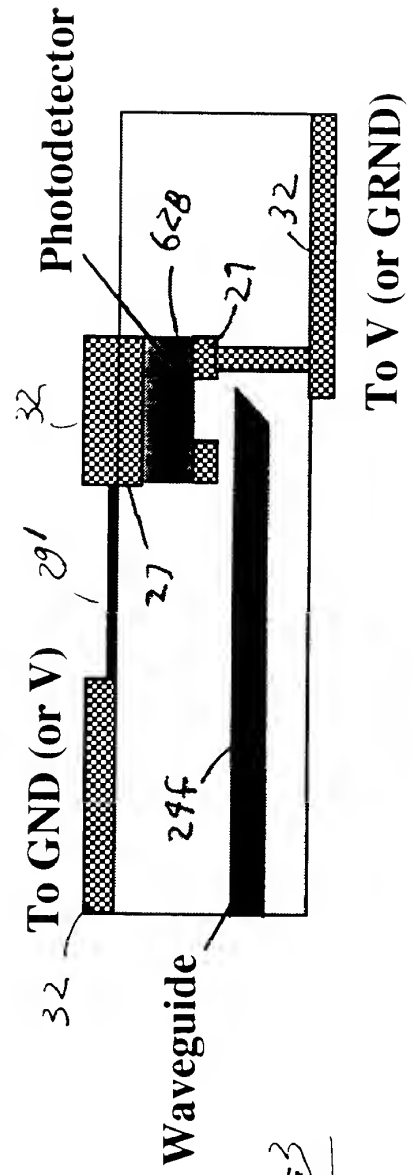


Fig. 4-3

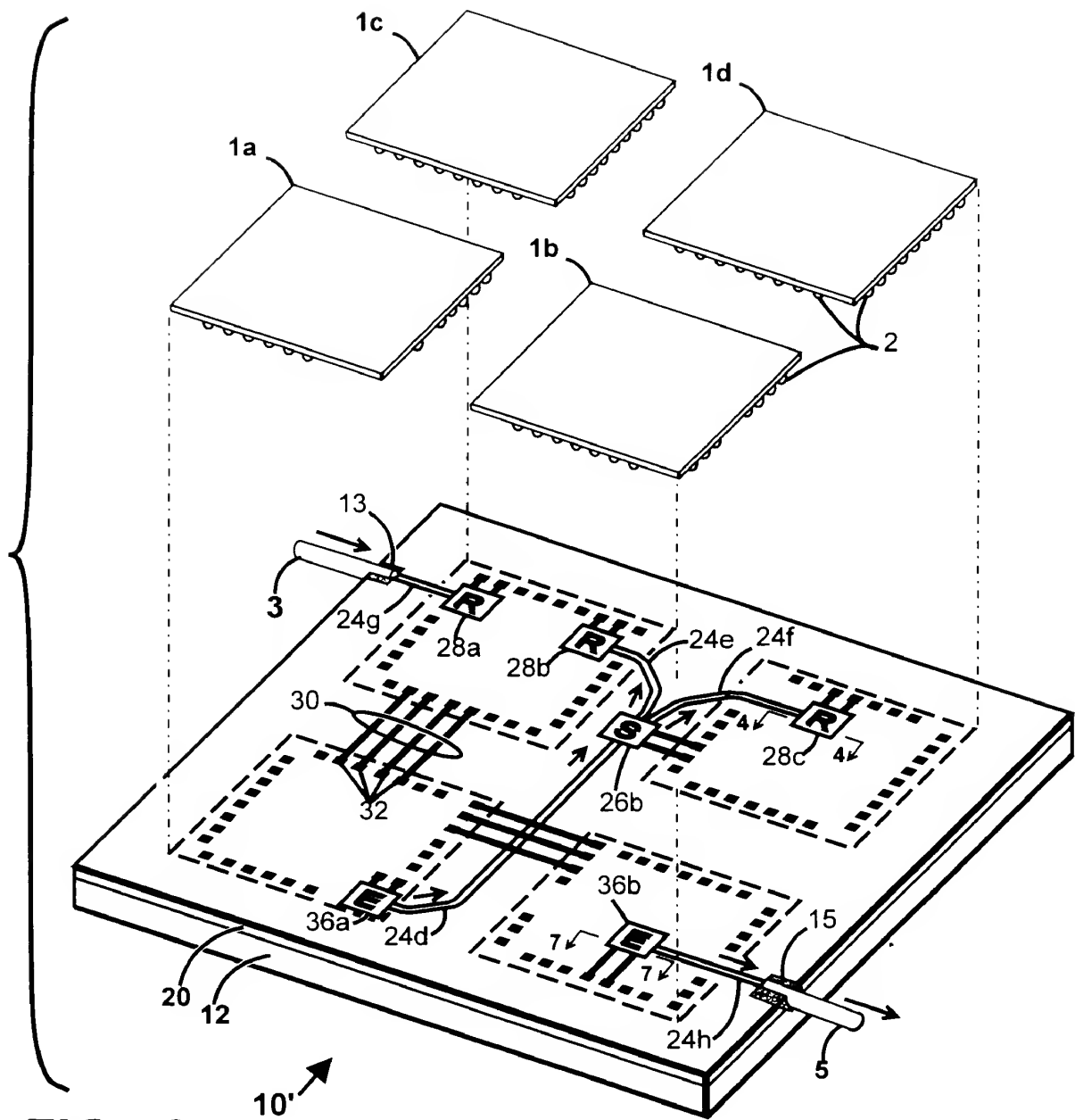


FIG._6

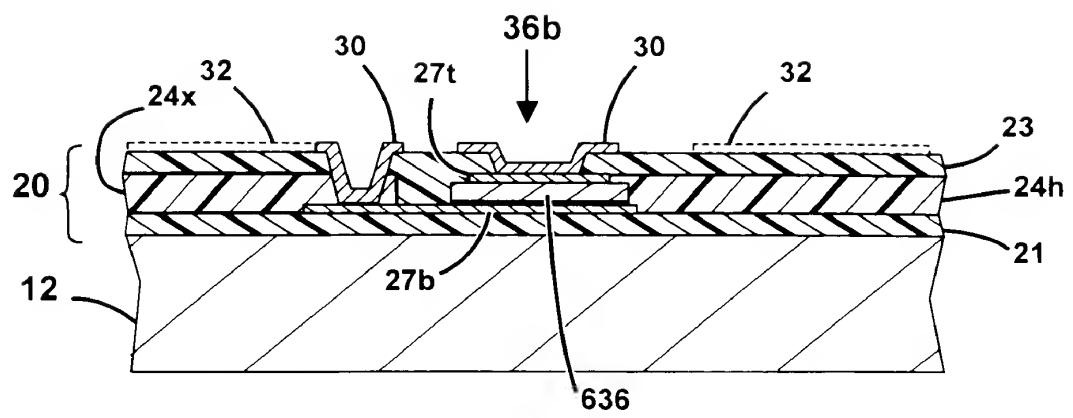


FIG._7

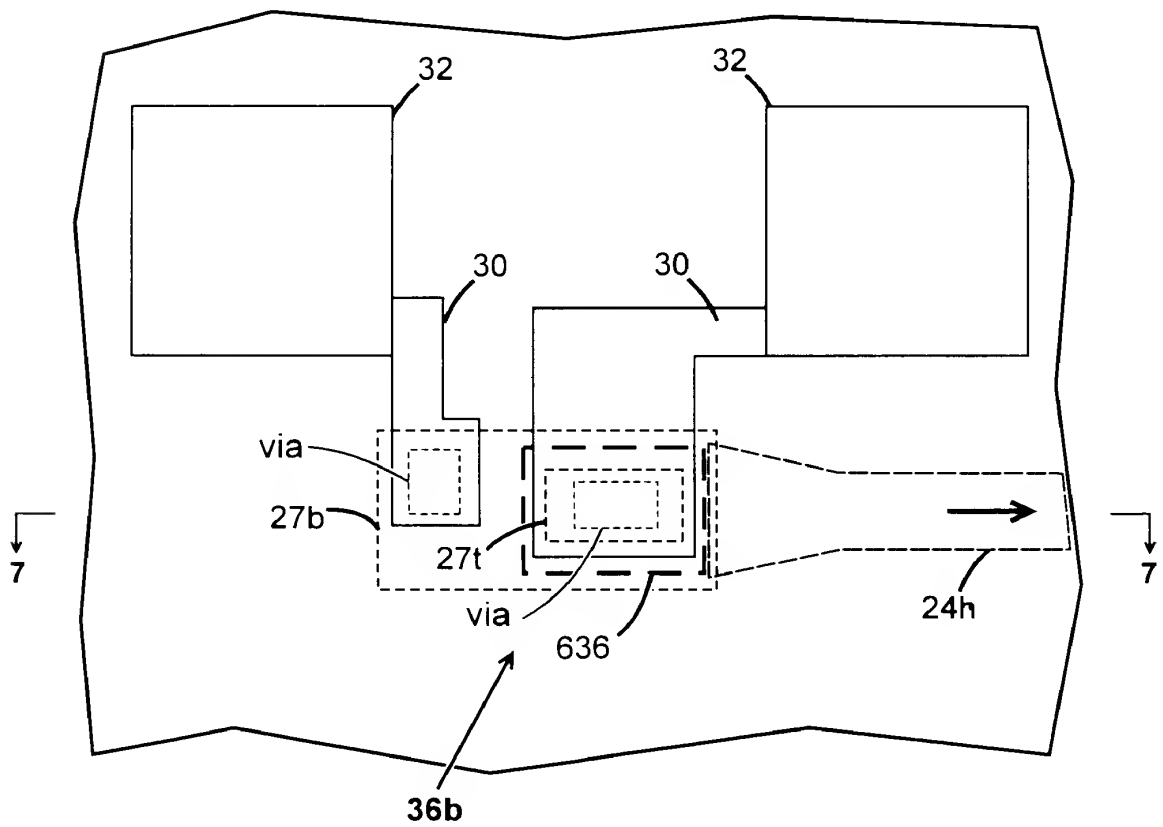


FIG._8

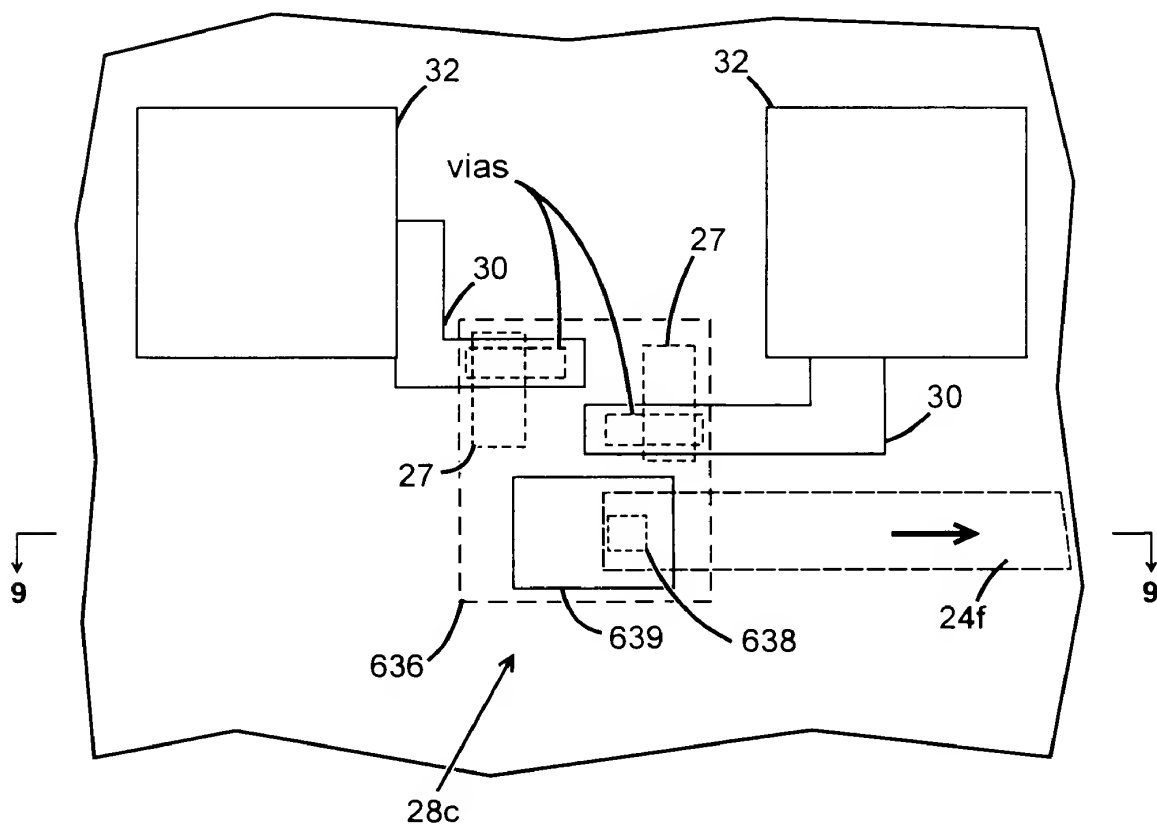
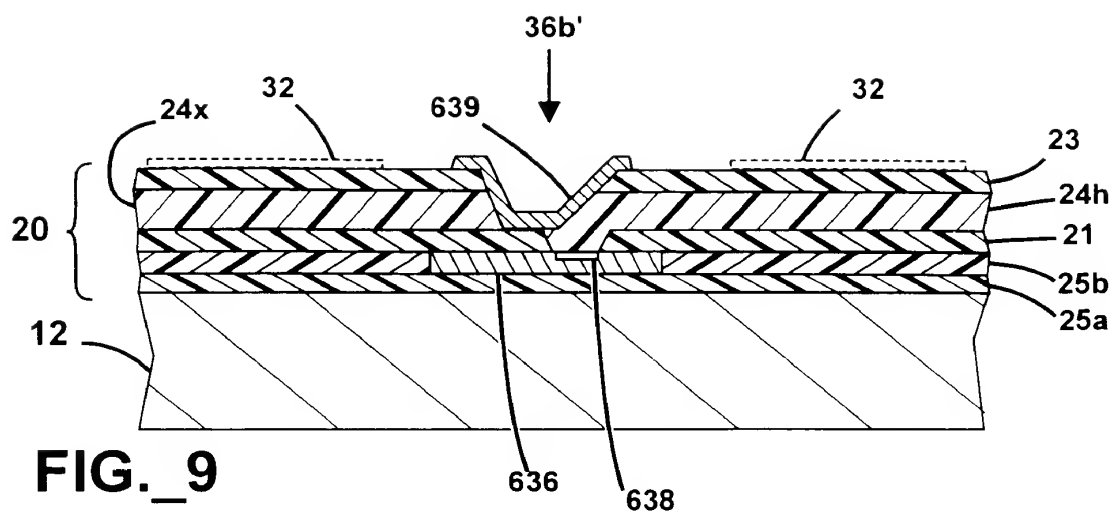


FIG._11

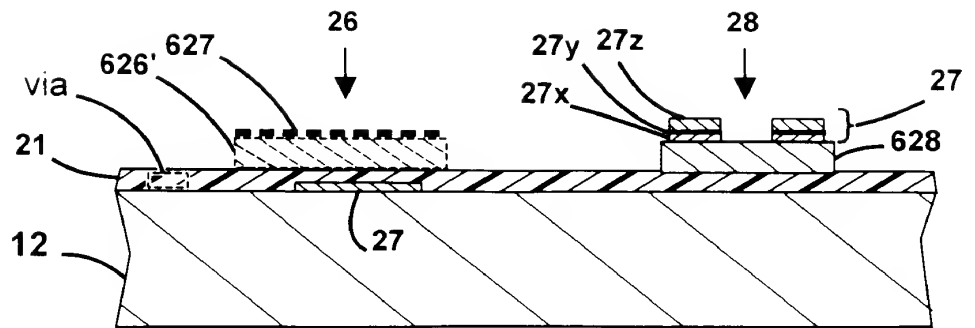


FIG._12

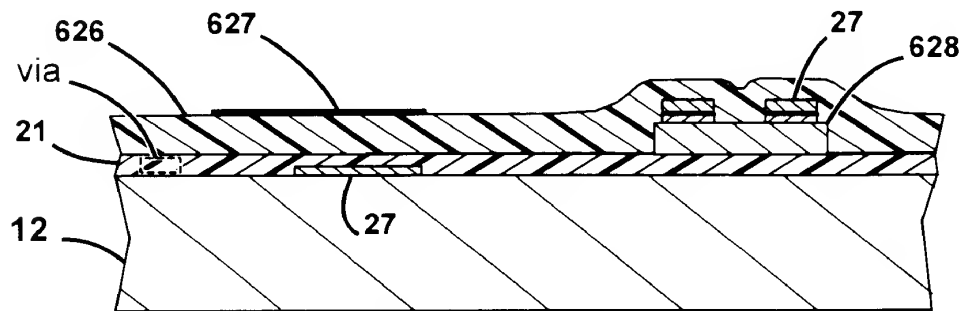


FIG._13

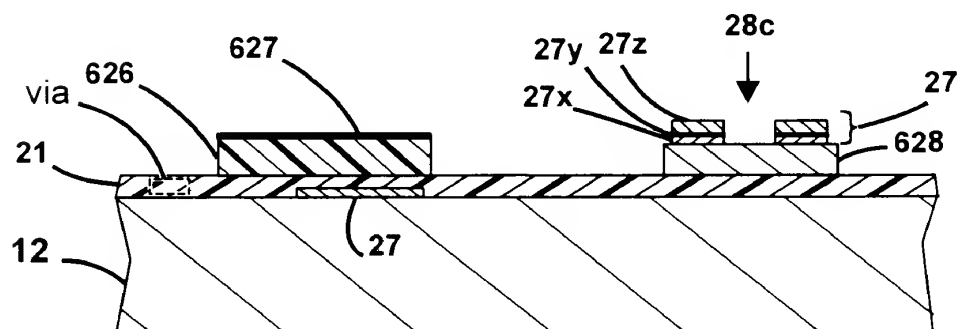


FIG._14

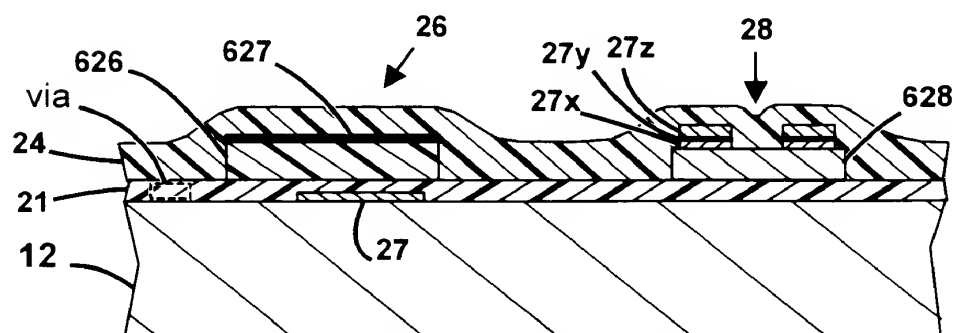


FIG._15

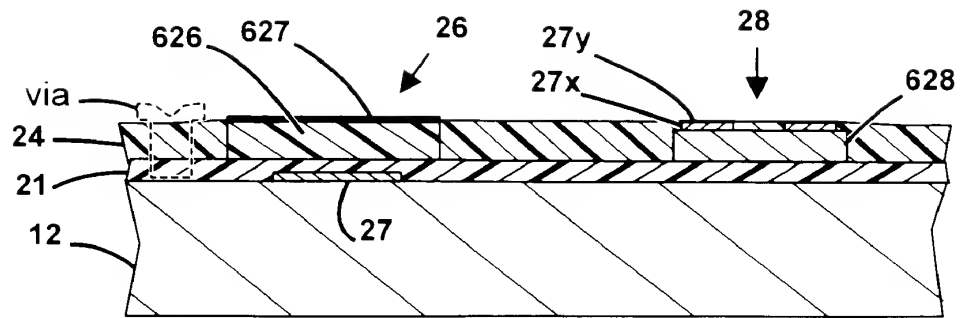


FIG._16

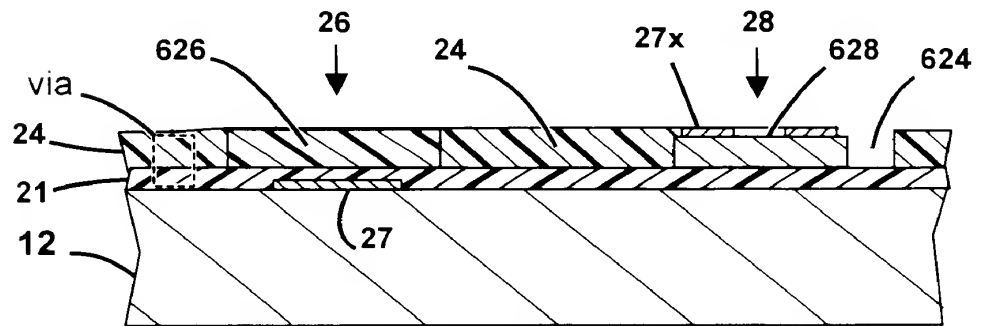


FIG._17

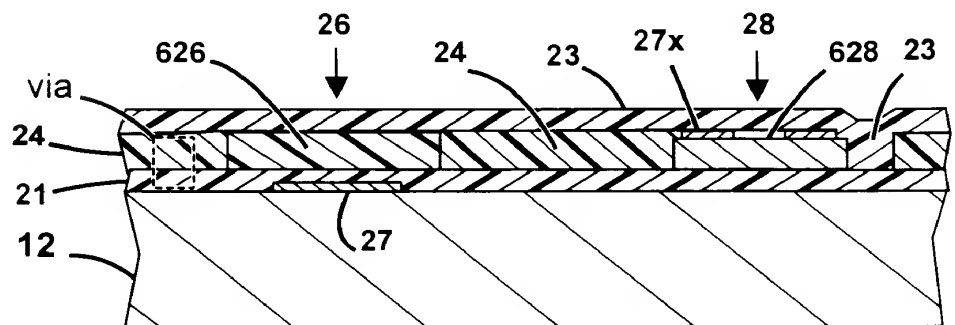
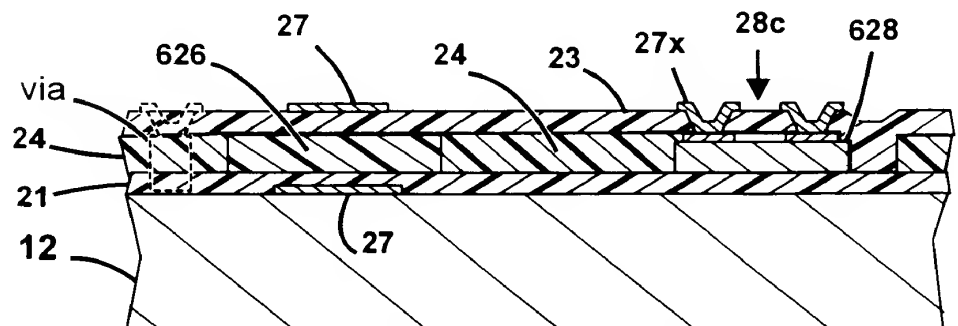


FIG._18



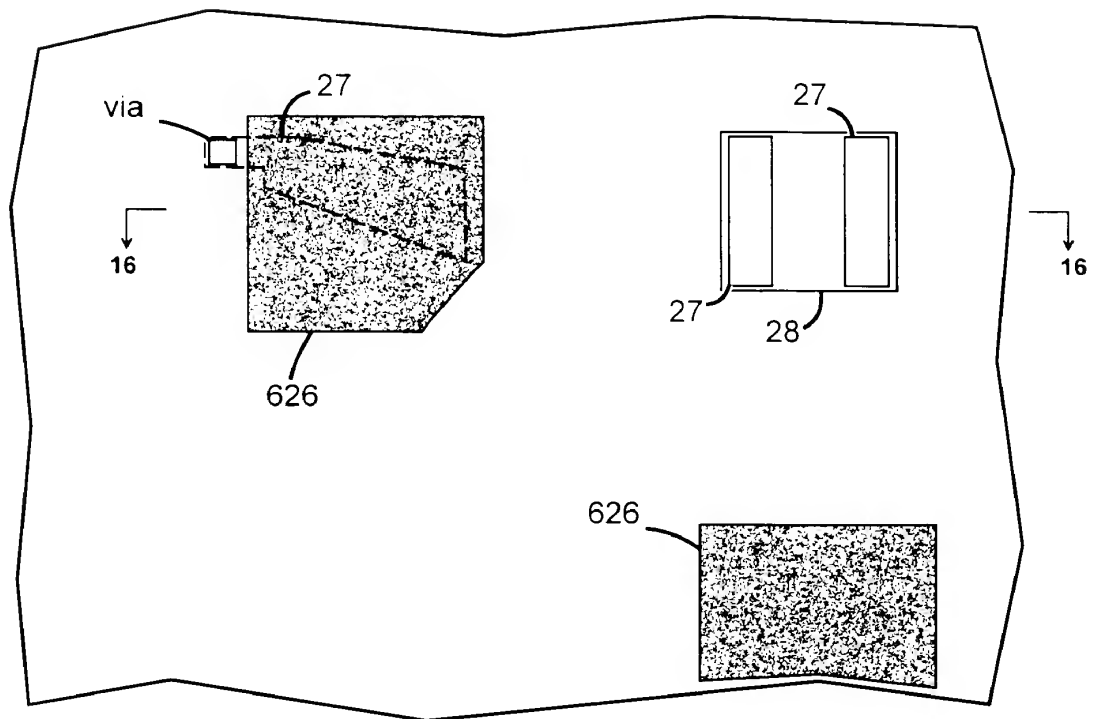


FIG._19

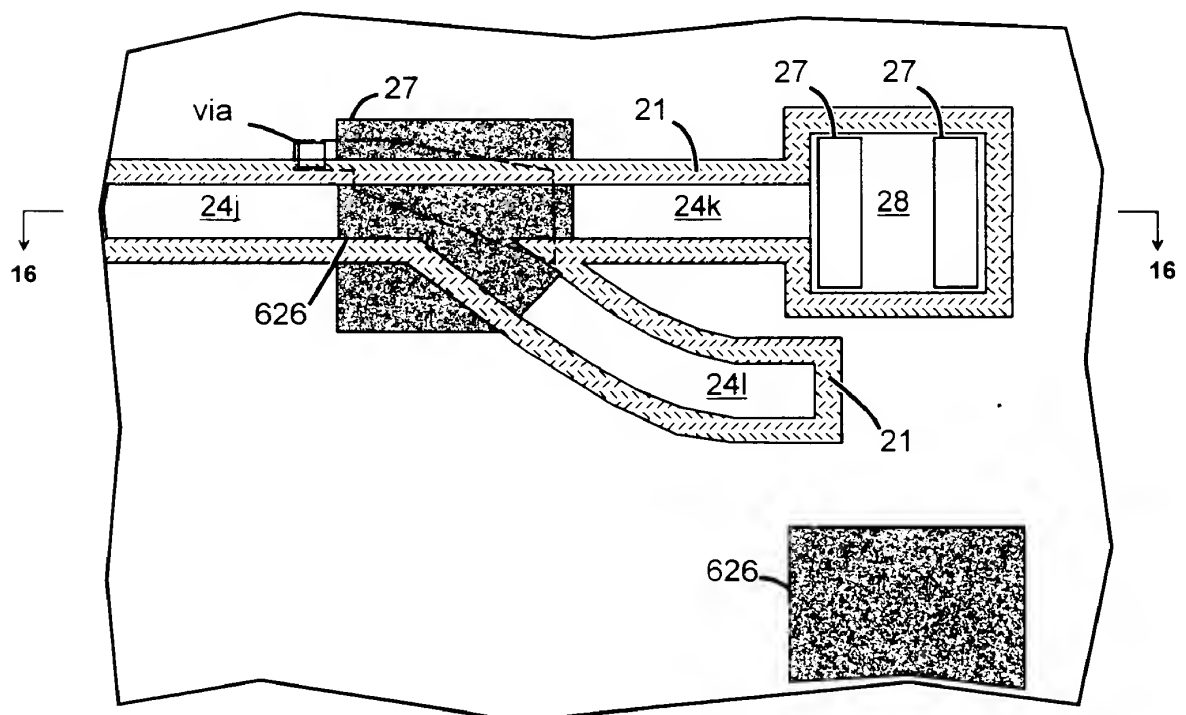


FIG._20

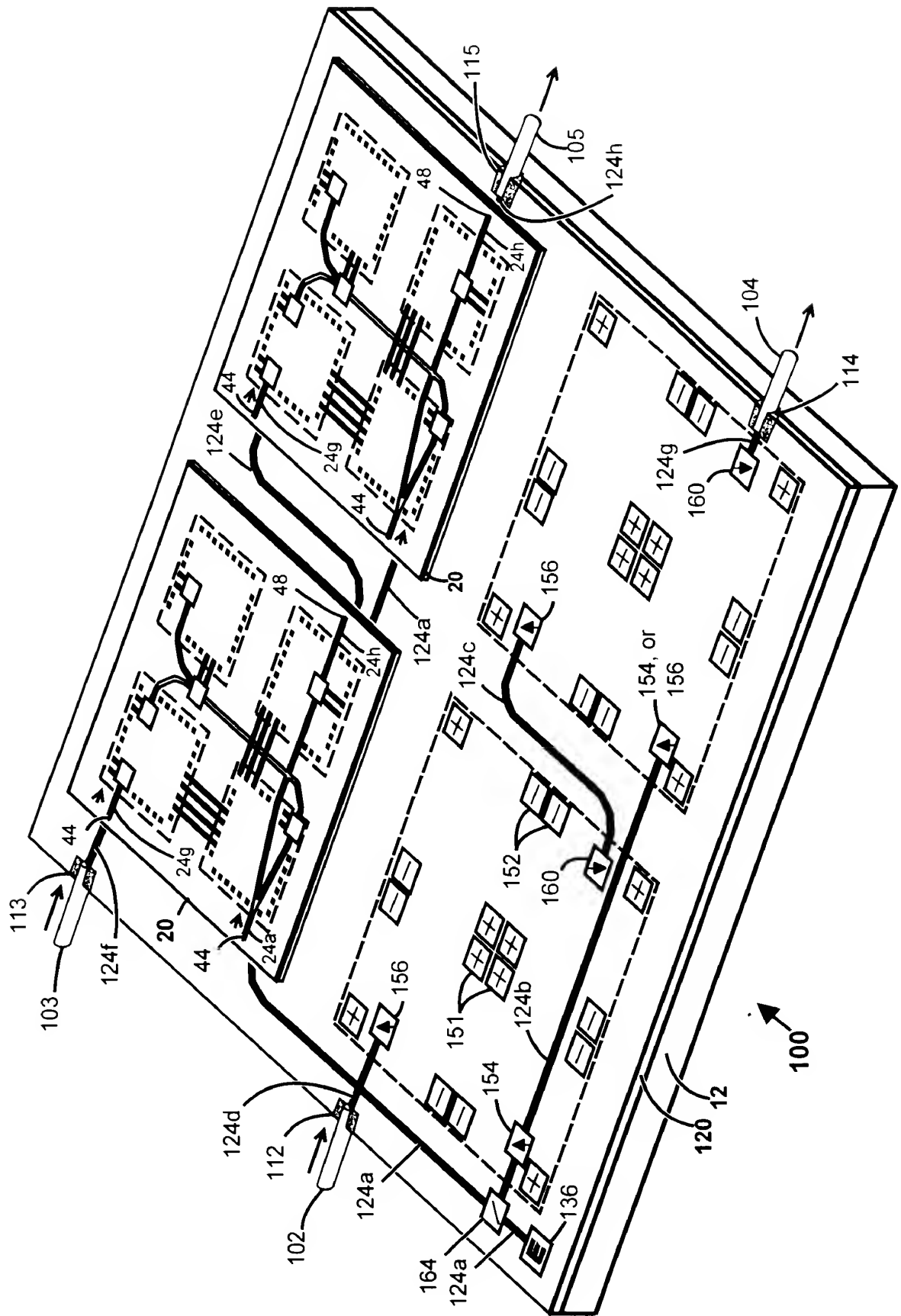


FIG. 21

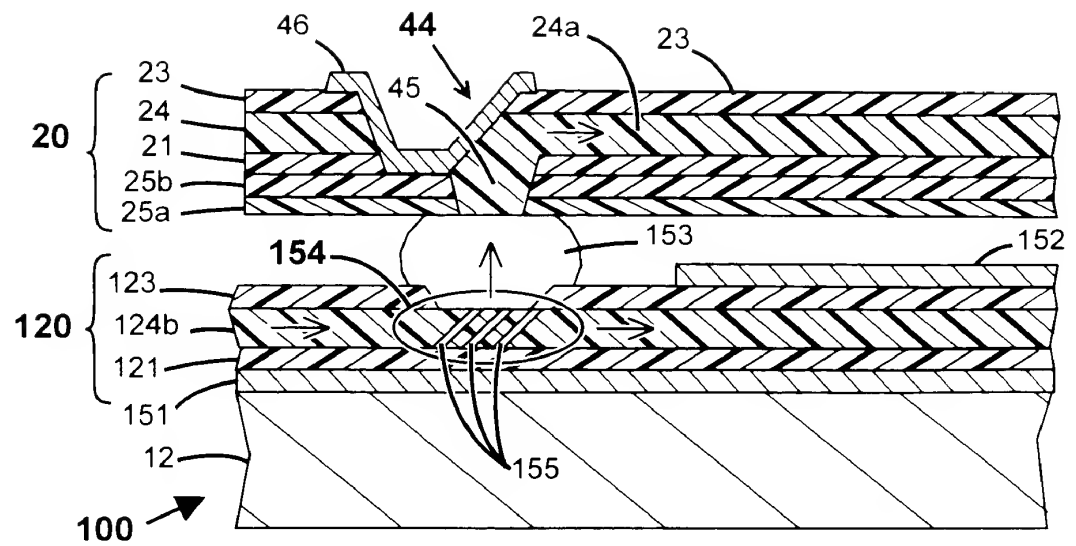


FIG. 22

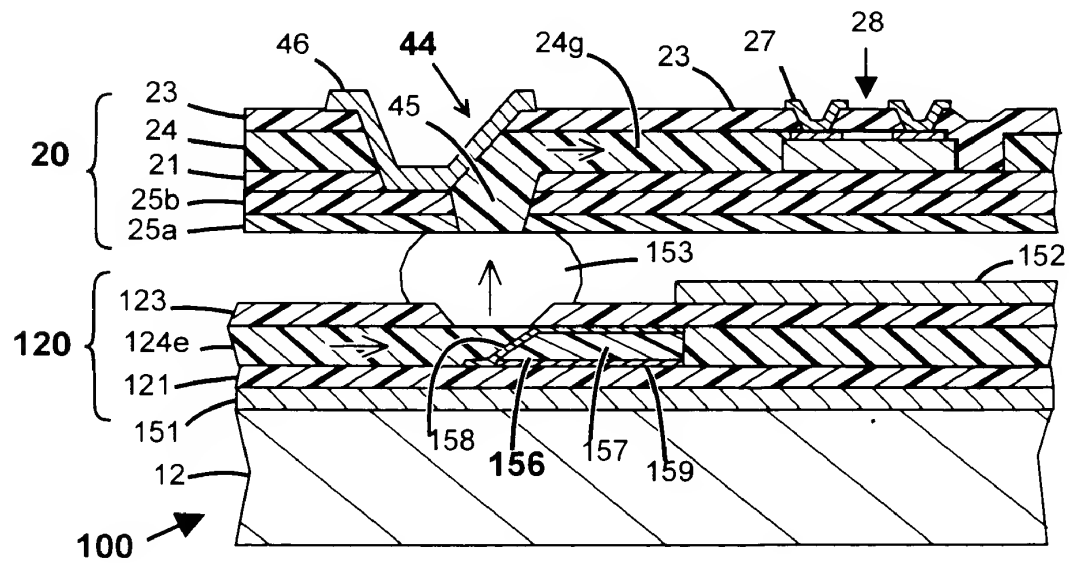


FIG. 23

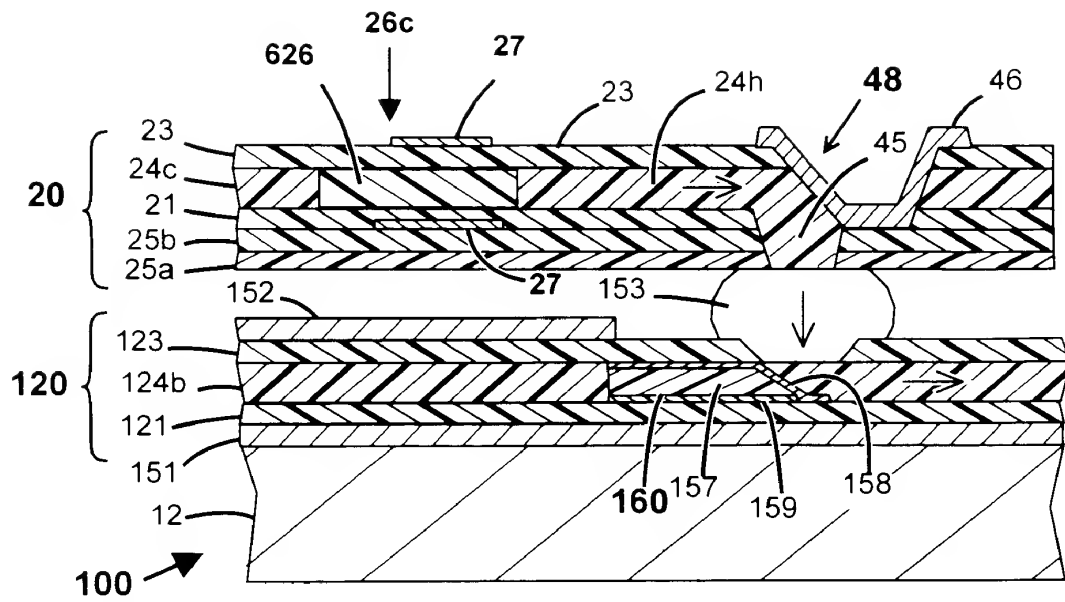


FIG._24

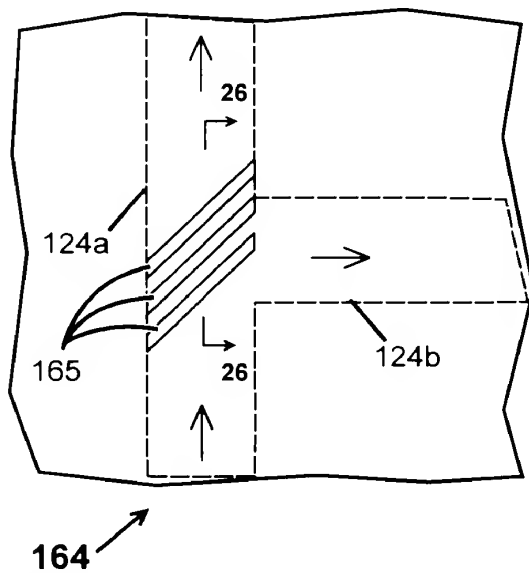


FIG._25

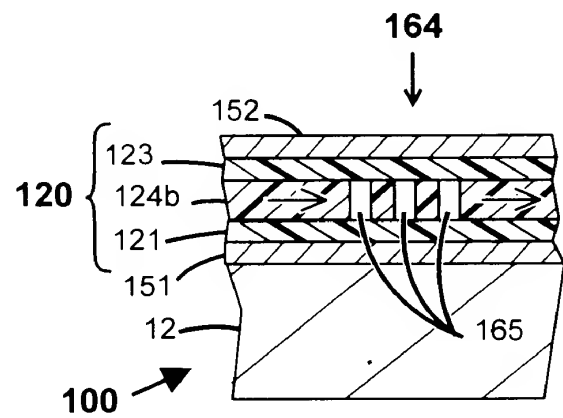


FIG._26

FIG._27

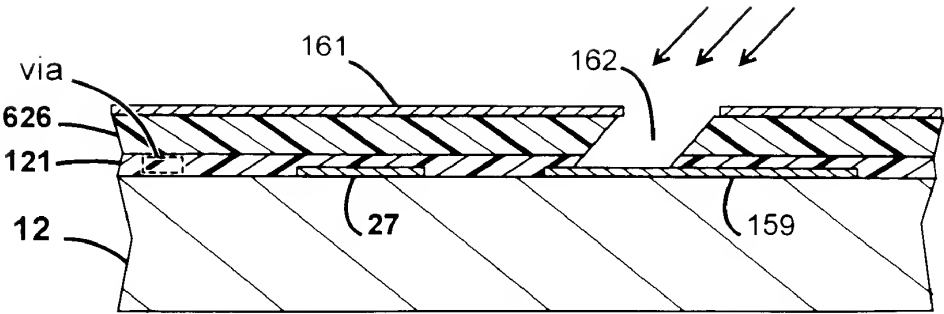


FIG._28

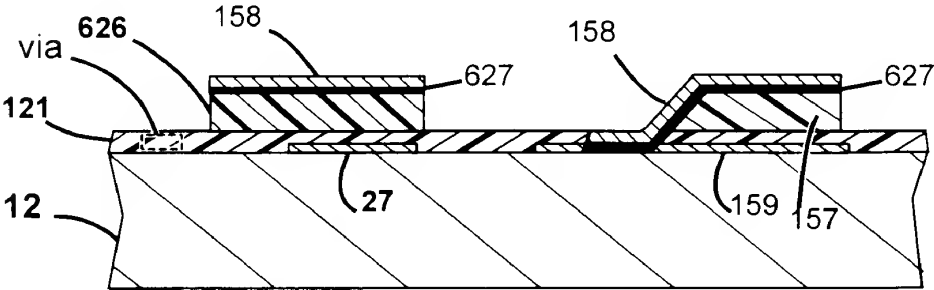


FIG._29

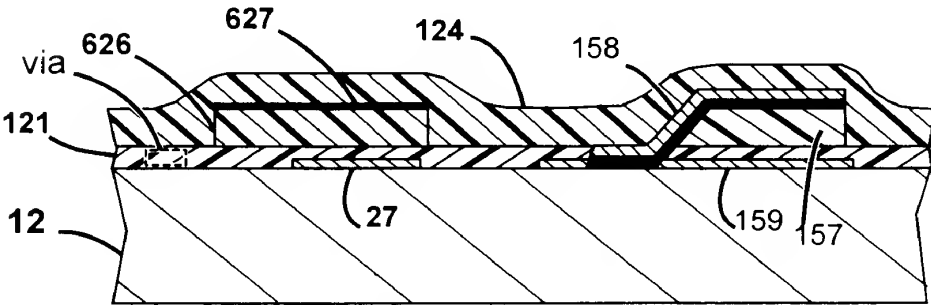
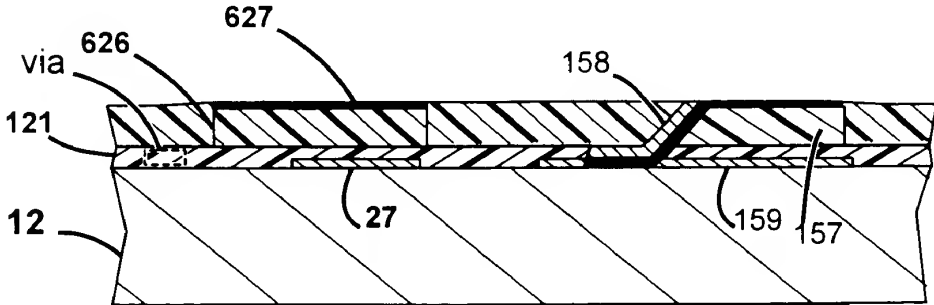


FIG._30



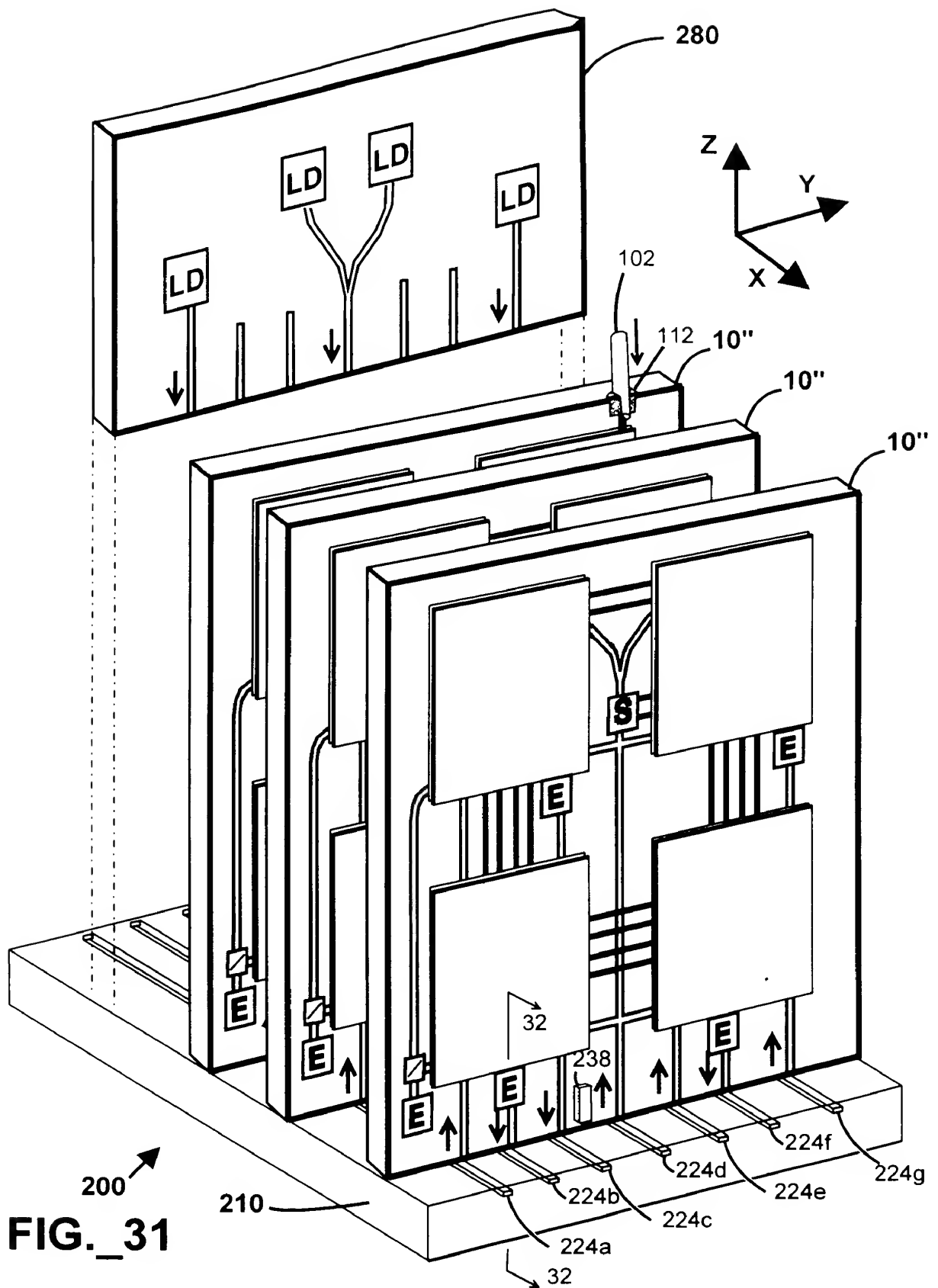


FIG. 32

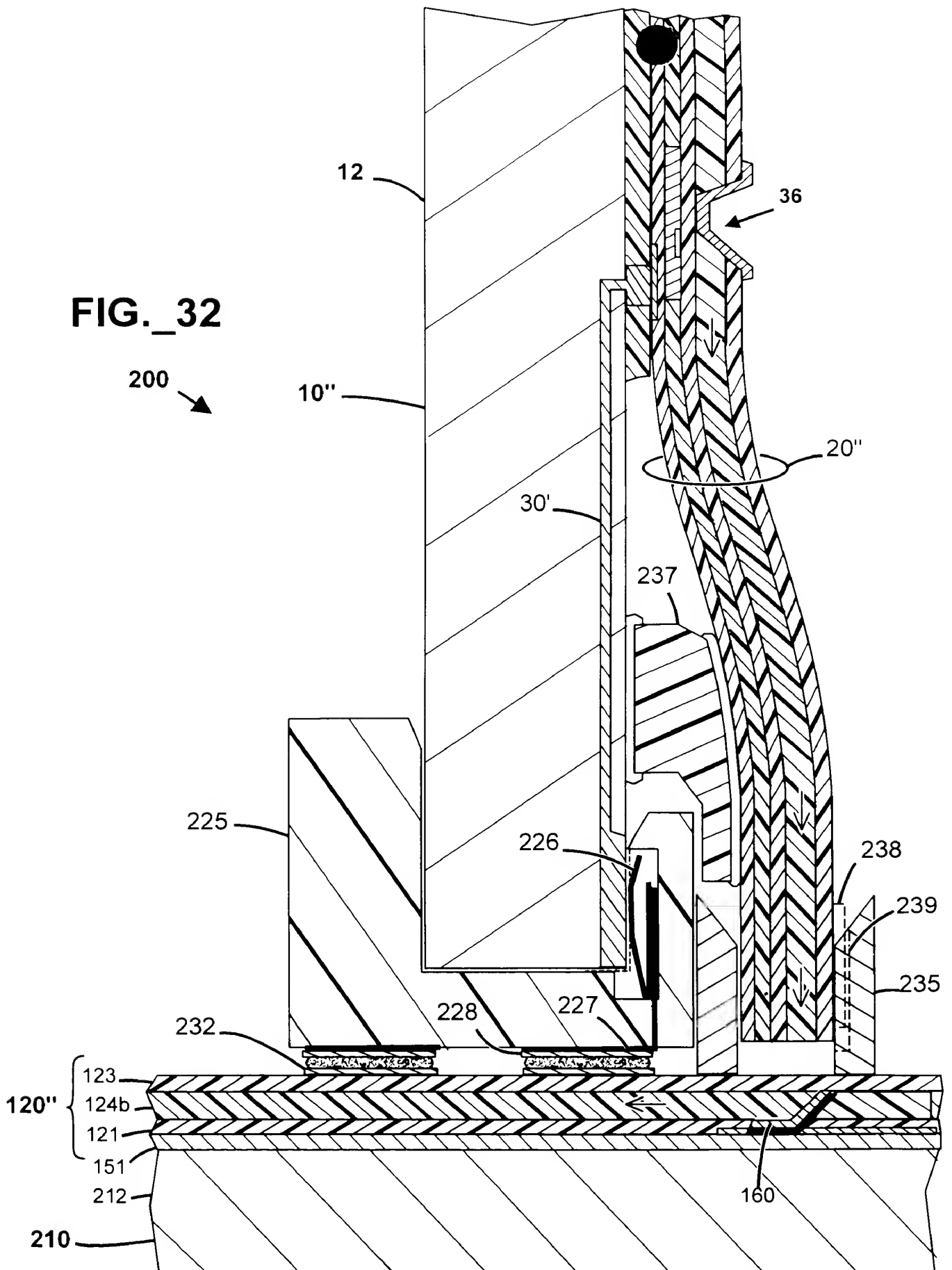
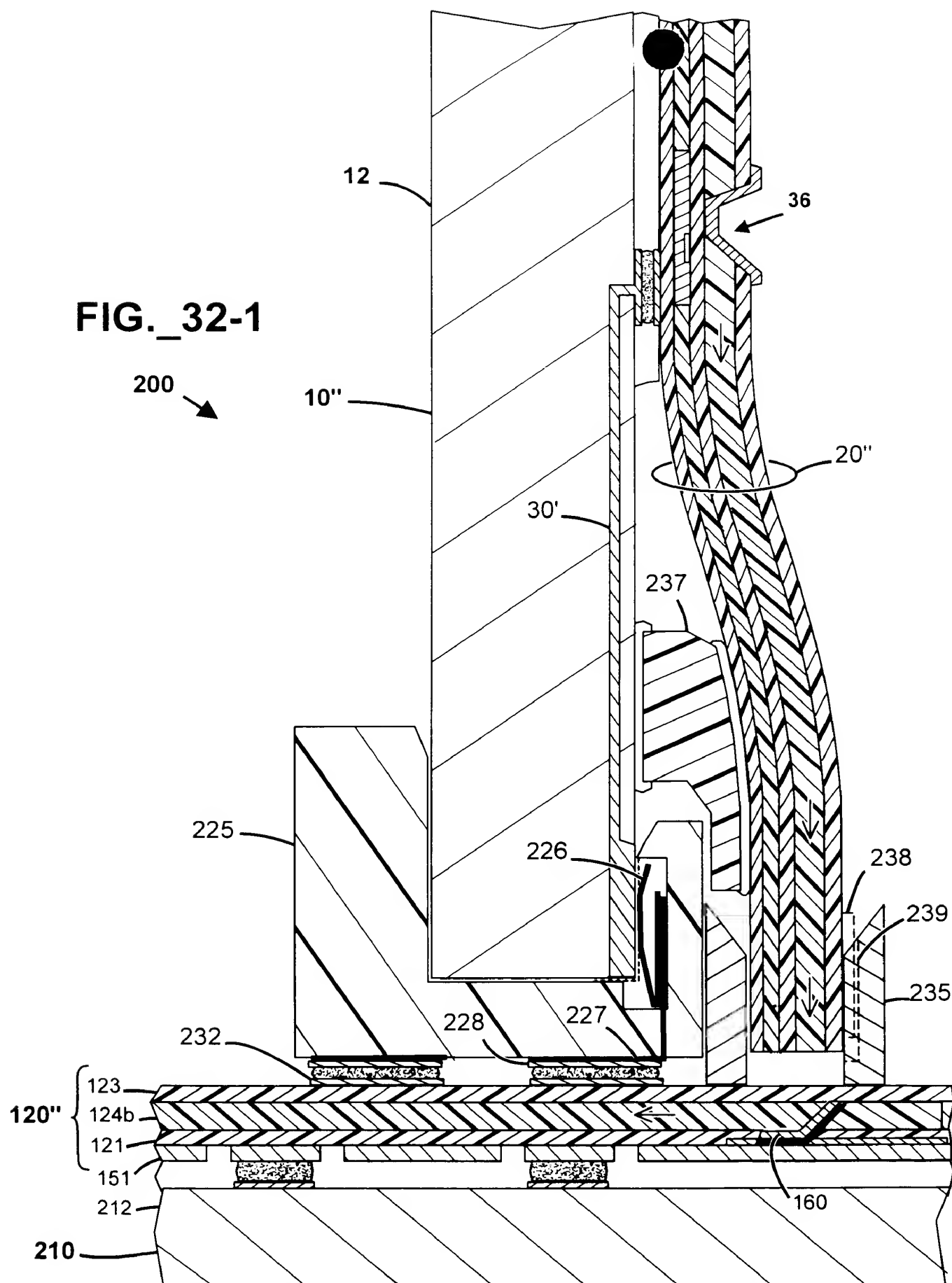
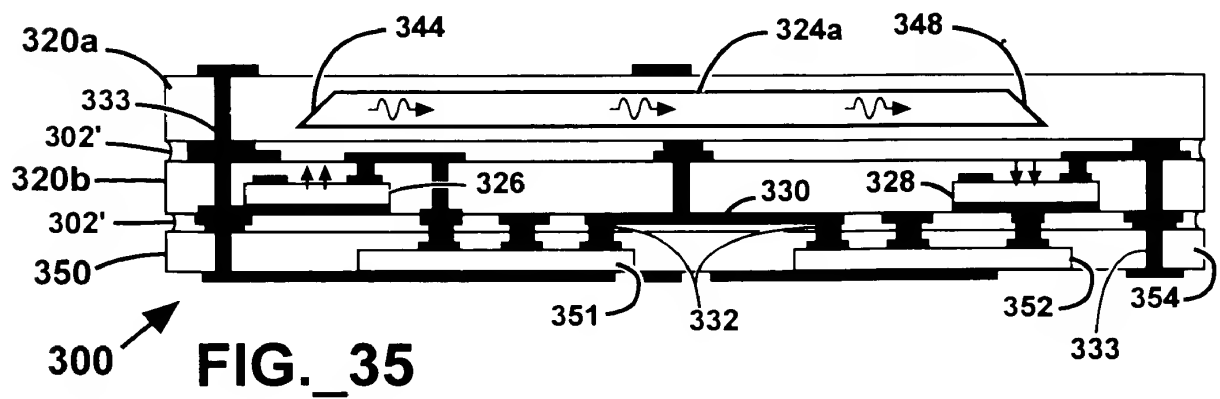
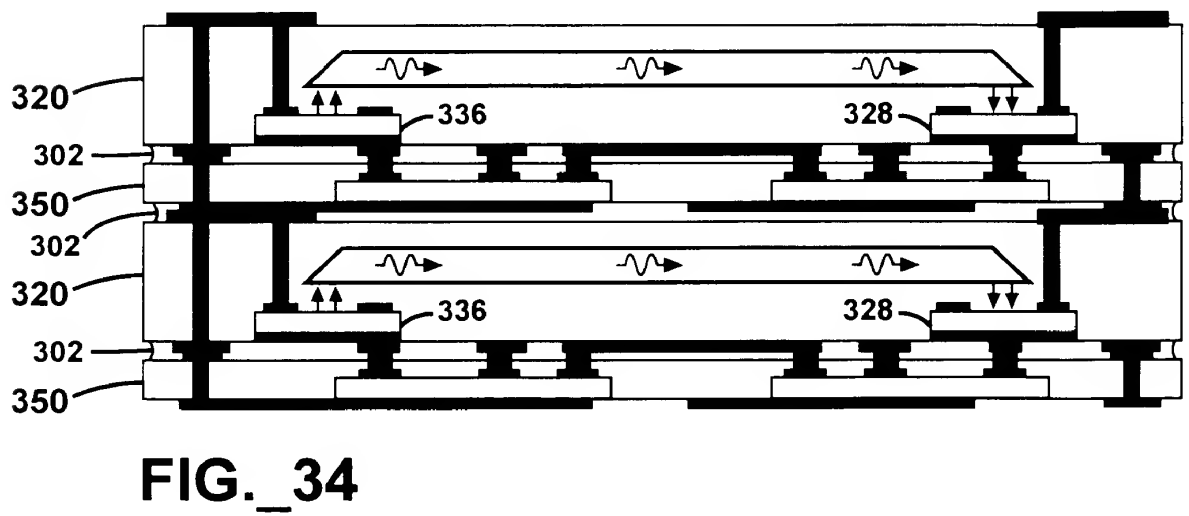
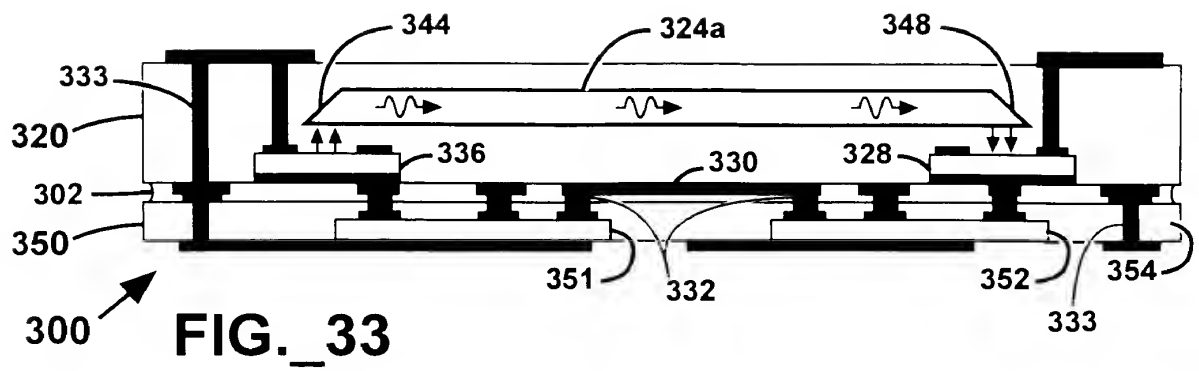


FIG._32-1





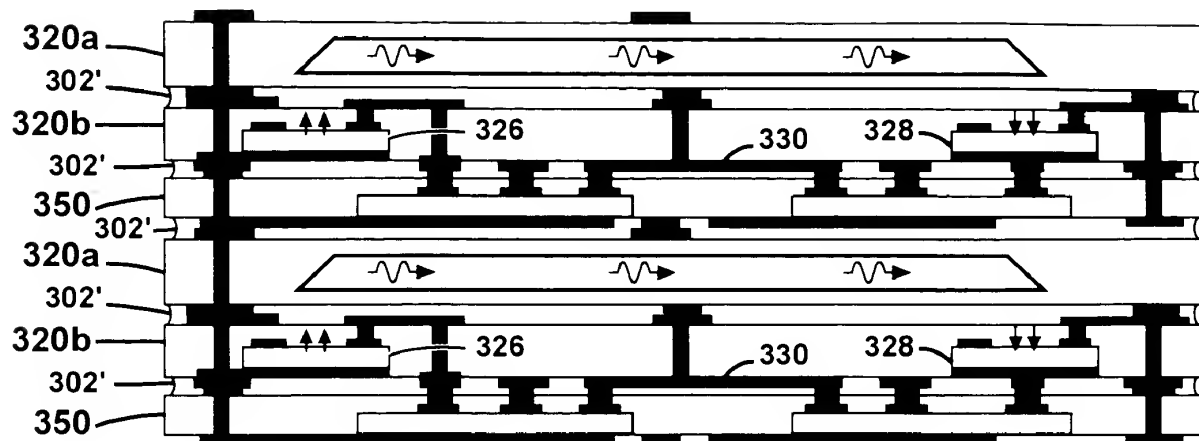


FIG. 36

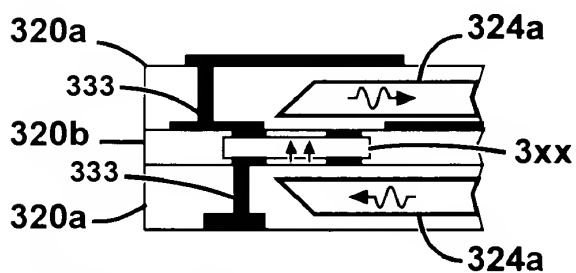


FIG. 37-1

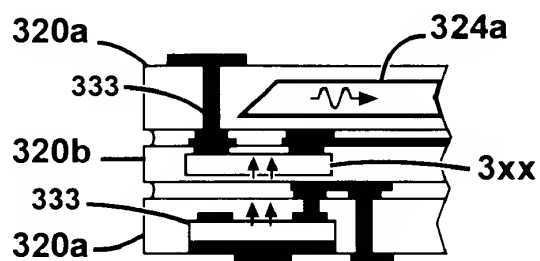


FIG. 37-2

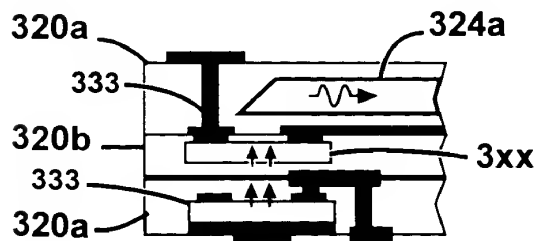


FIG. 37-3

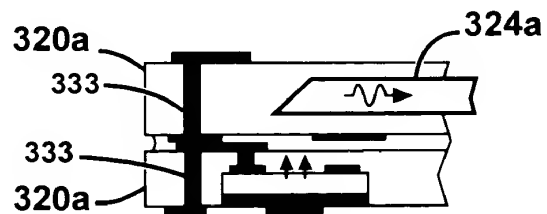


FIG. 37-4

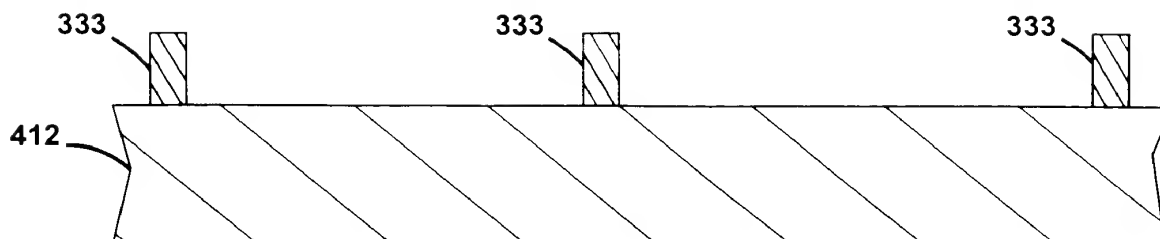


FIG._38

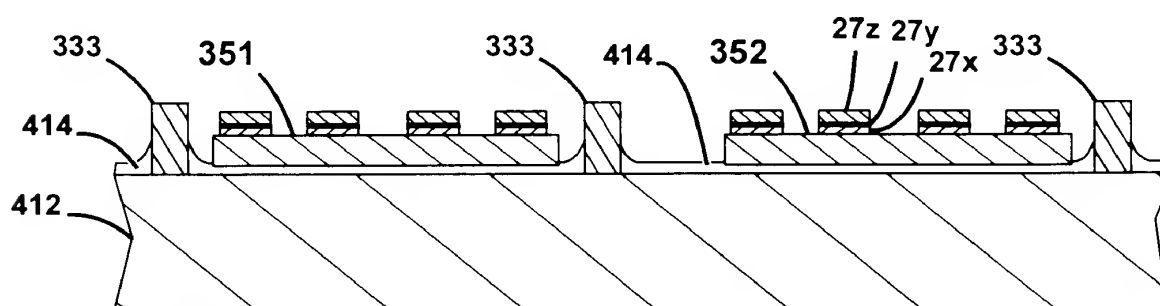


FIG._39

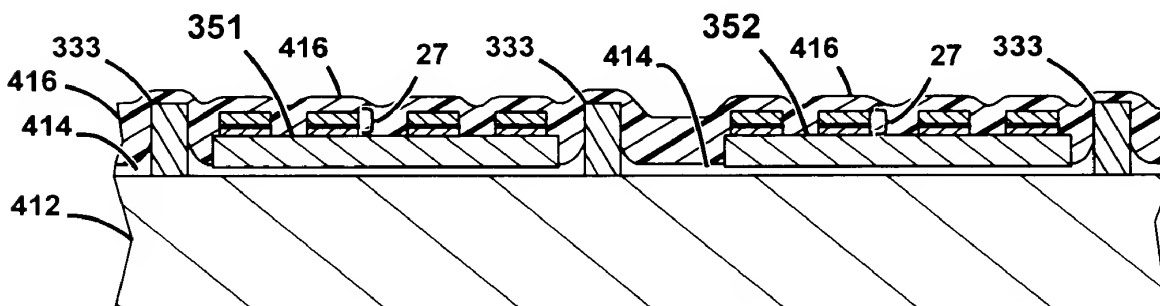


FIG._40

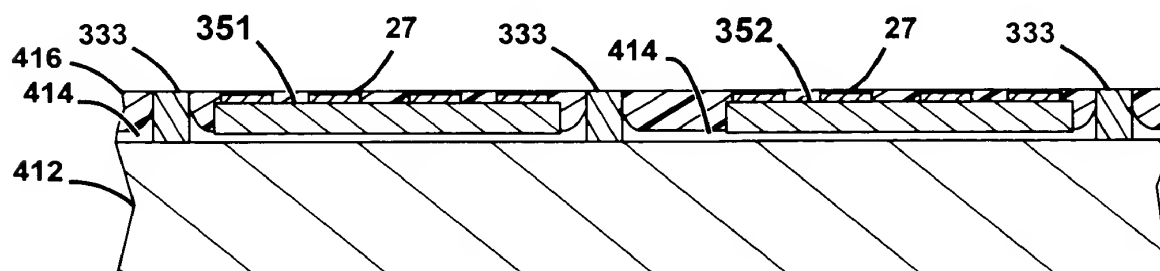


FIG._41

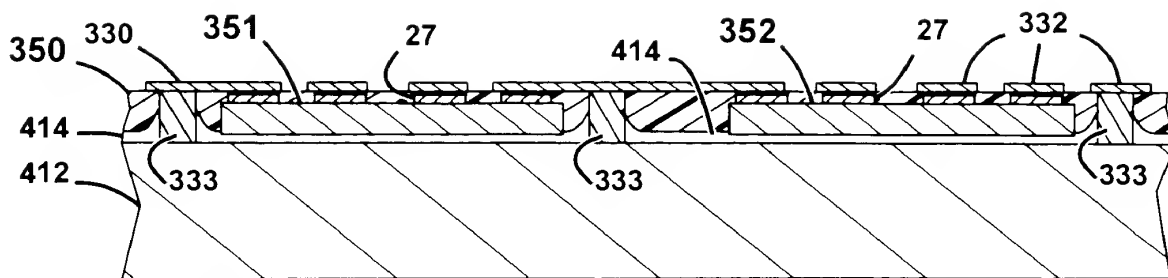


FIG._42

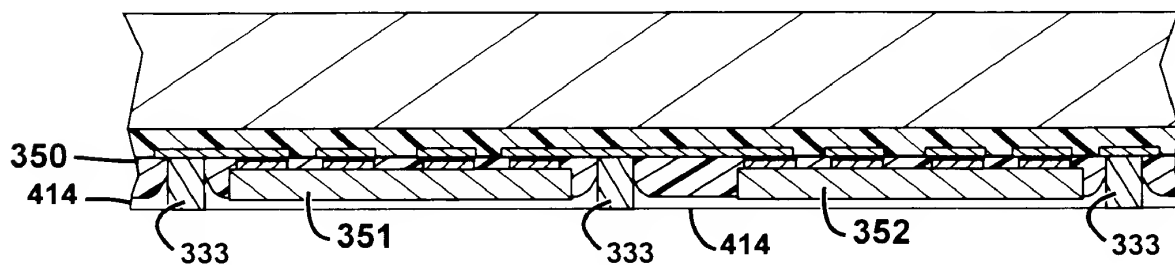


FIG._43

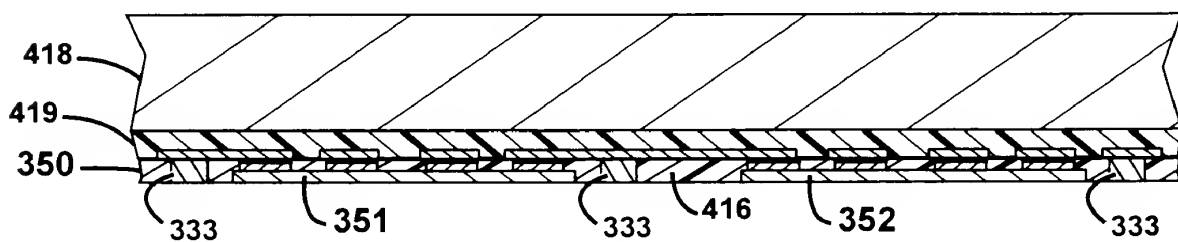


FIG._44

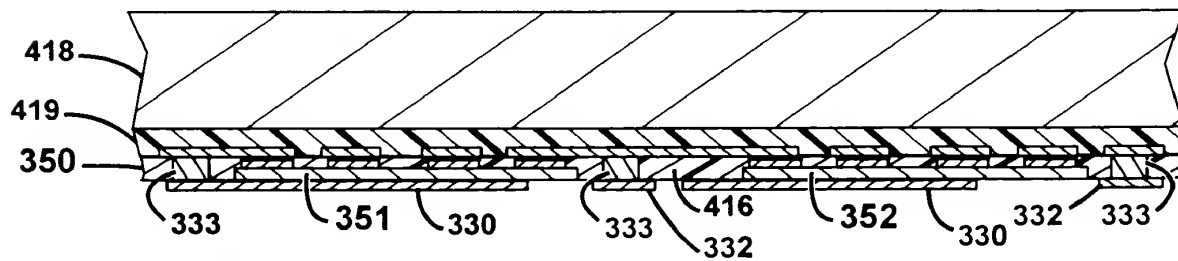
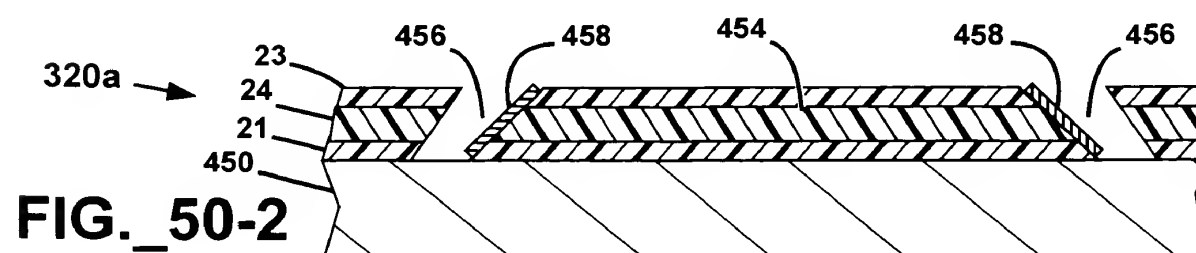
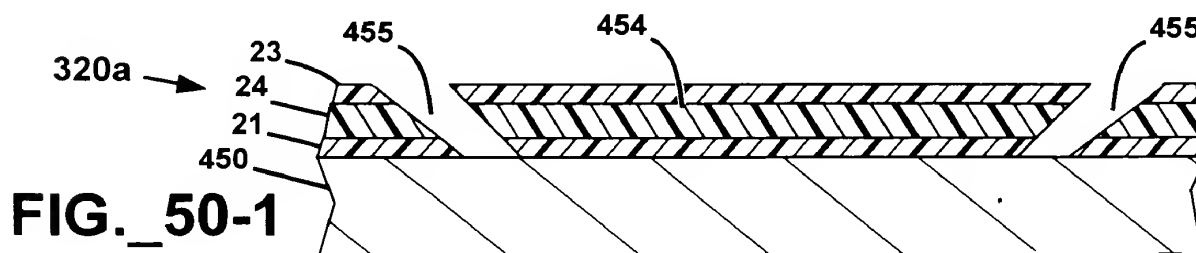
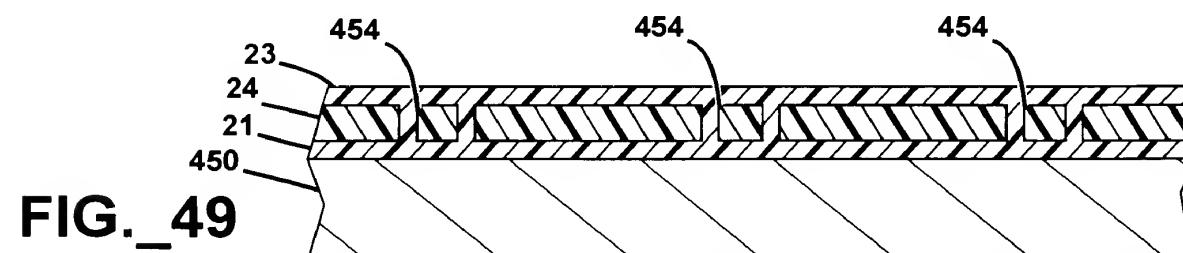
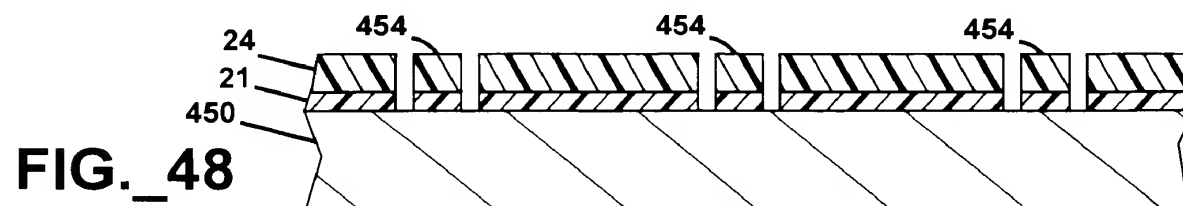
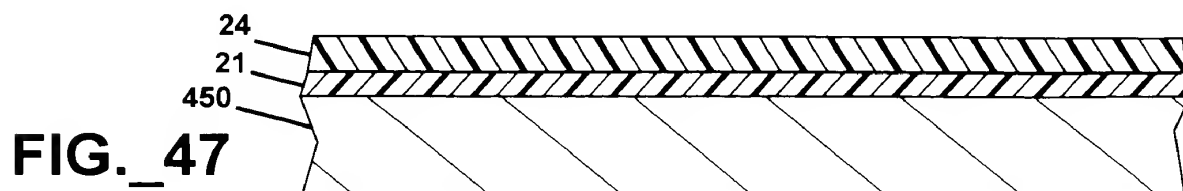
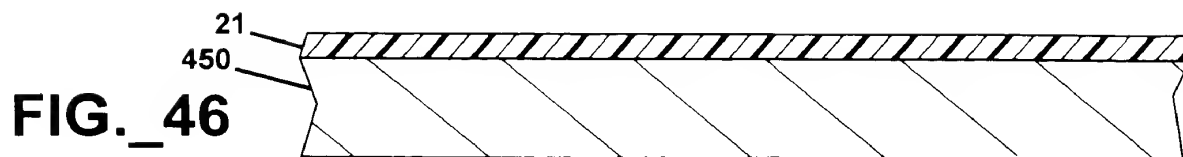
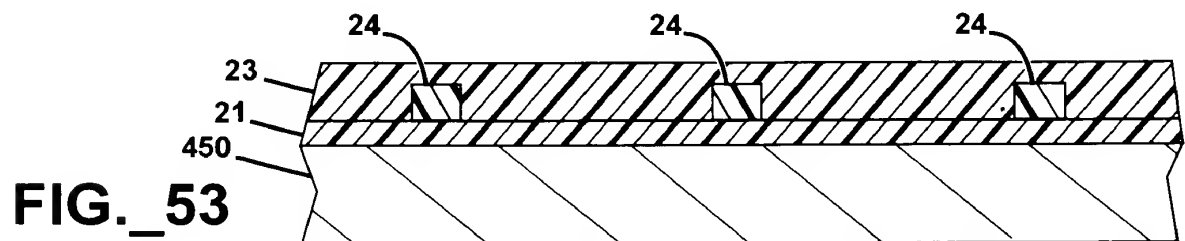
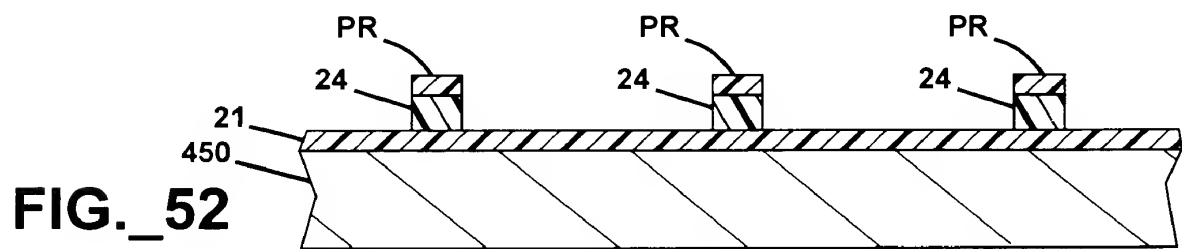
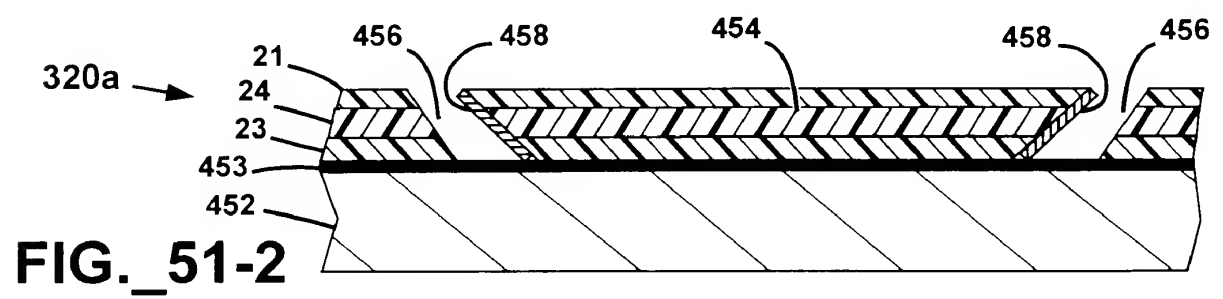
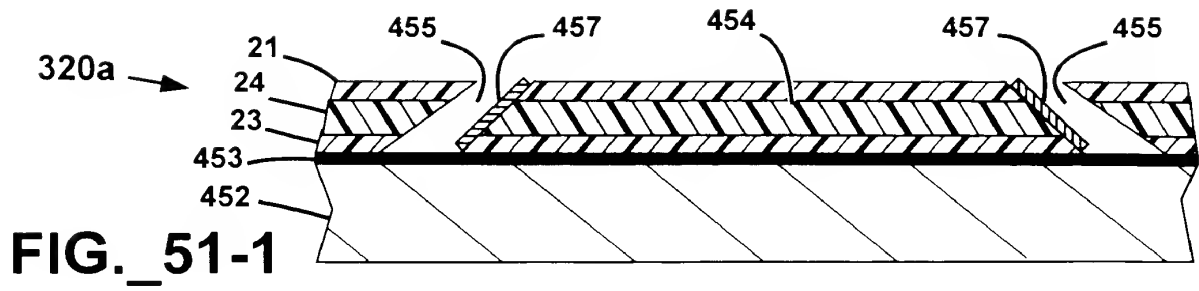
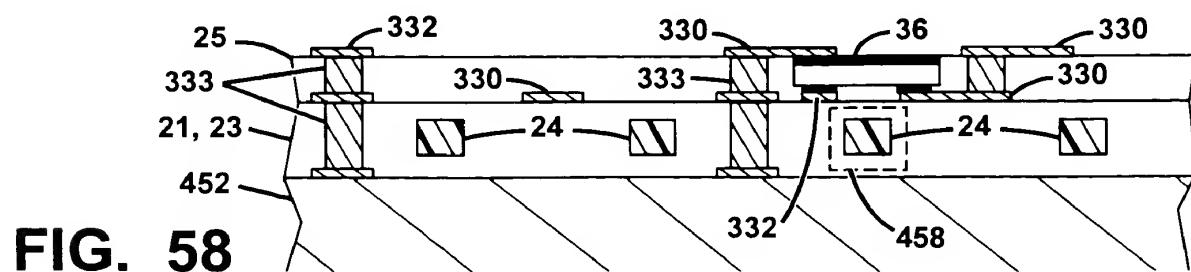
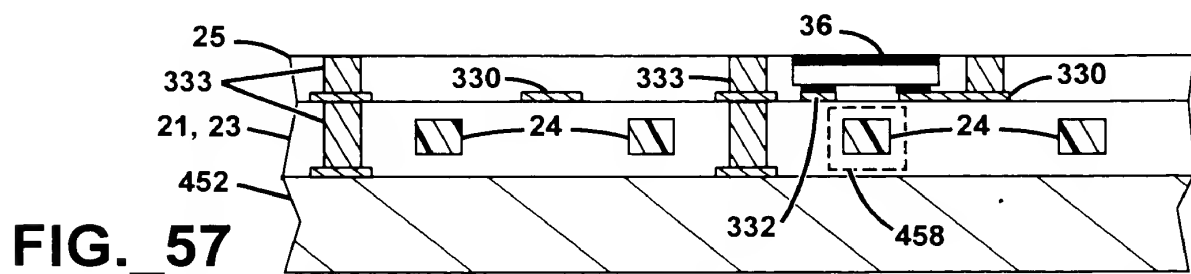
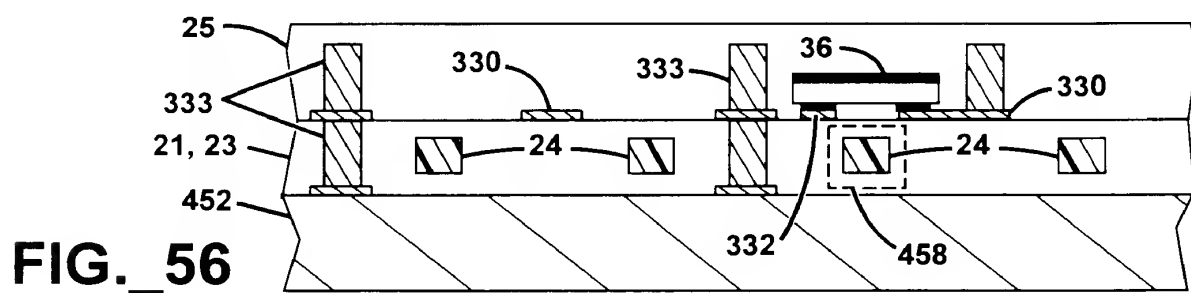
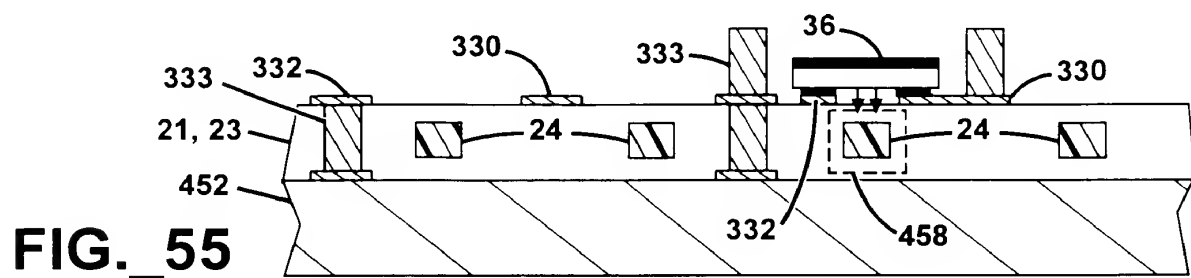
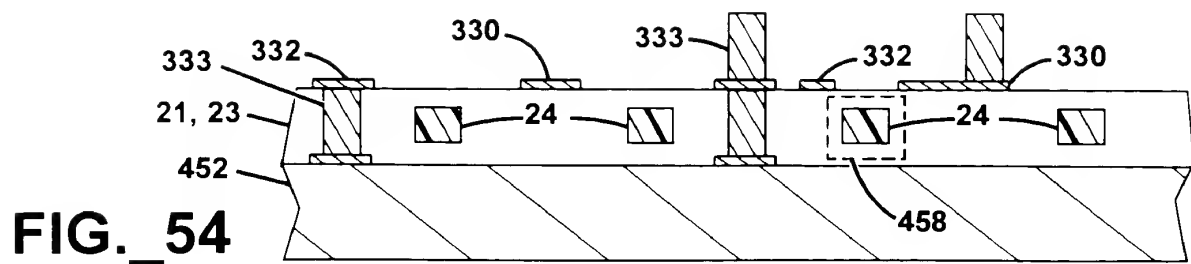


FIG._45







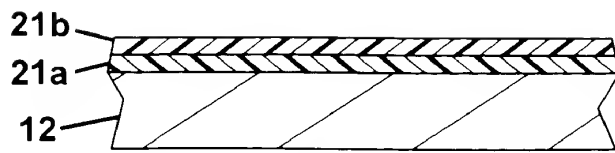


FIG._59

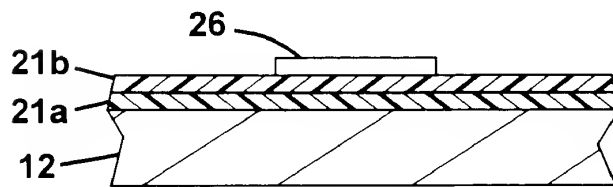


FIG._60

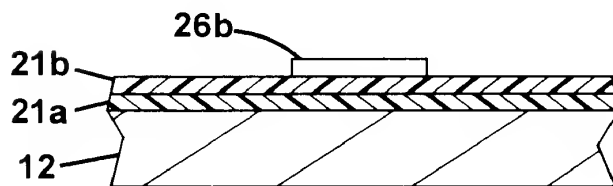


FIG._62

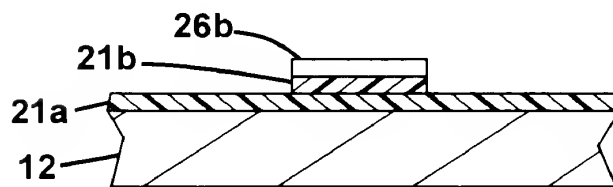


FIG._64

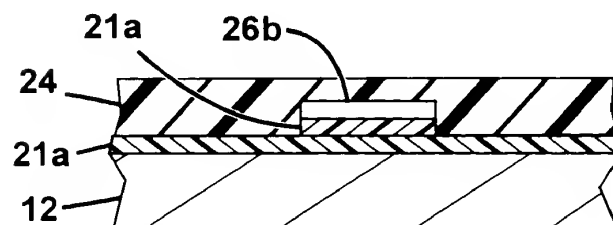


FIG._65

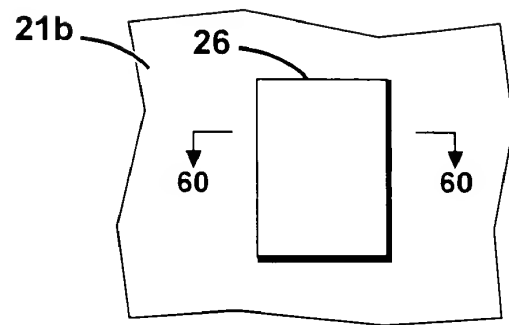


FIG._61

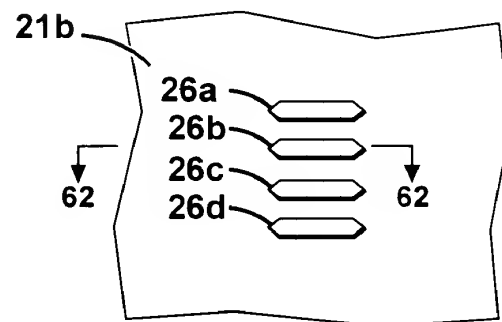


FIG._63

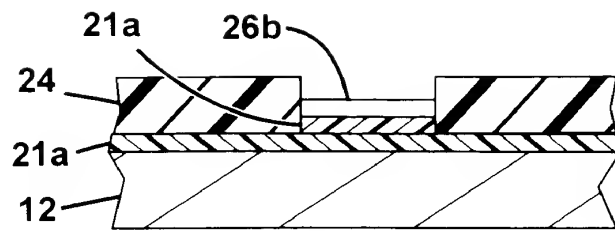


FIG. 66

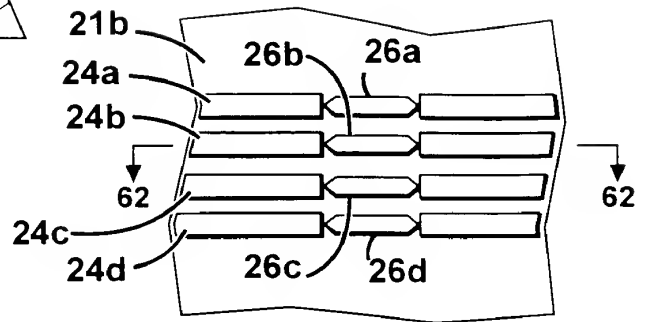


FIG. 67

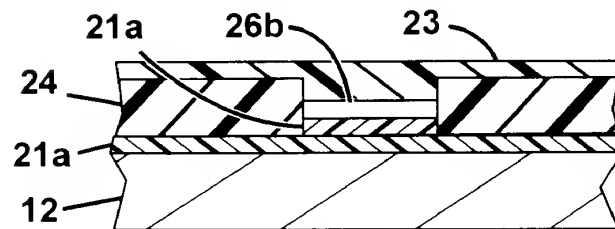


FIG. 68

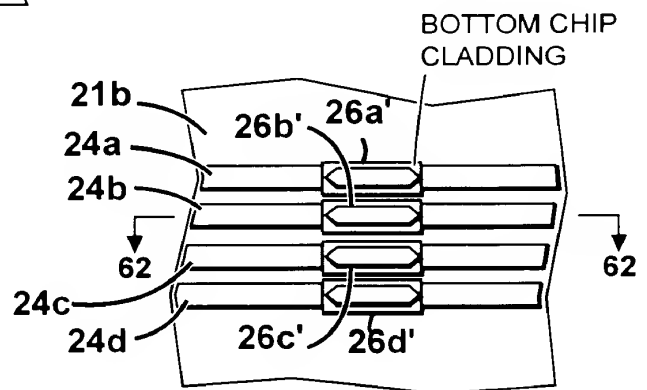
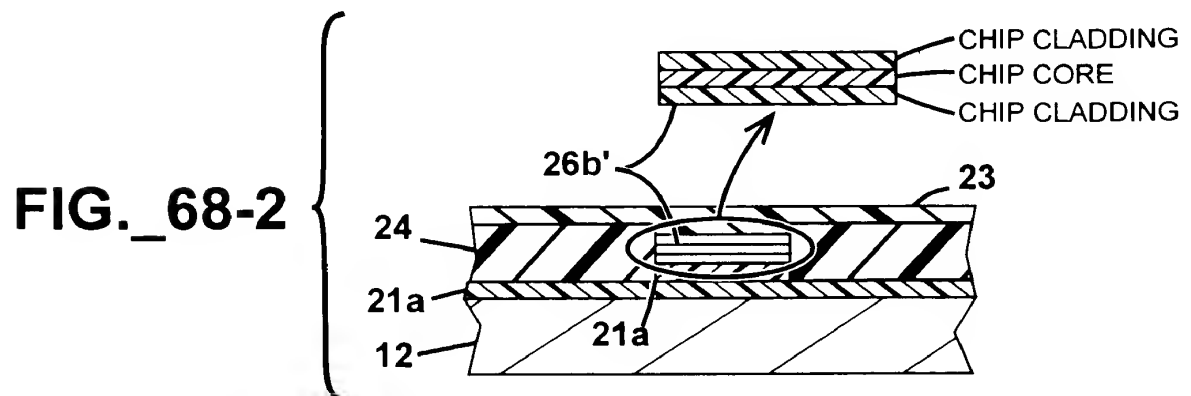


FIG. 67-2



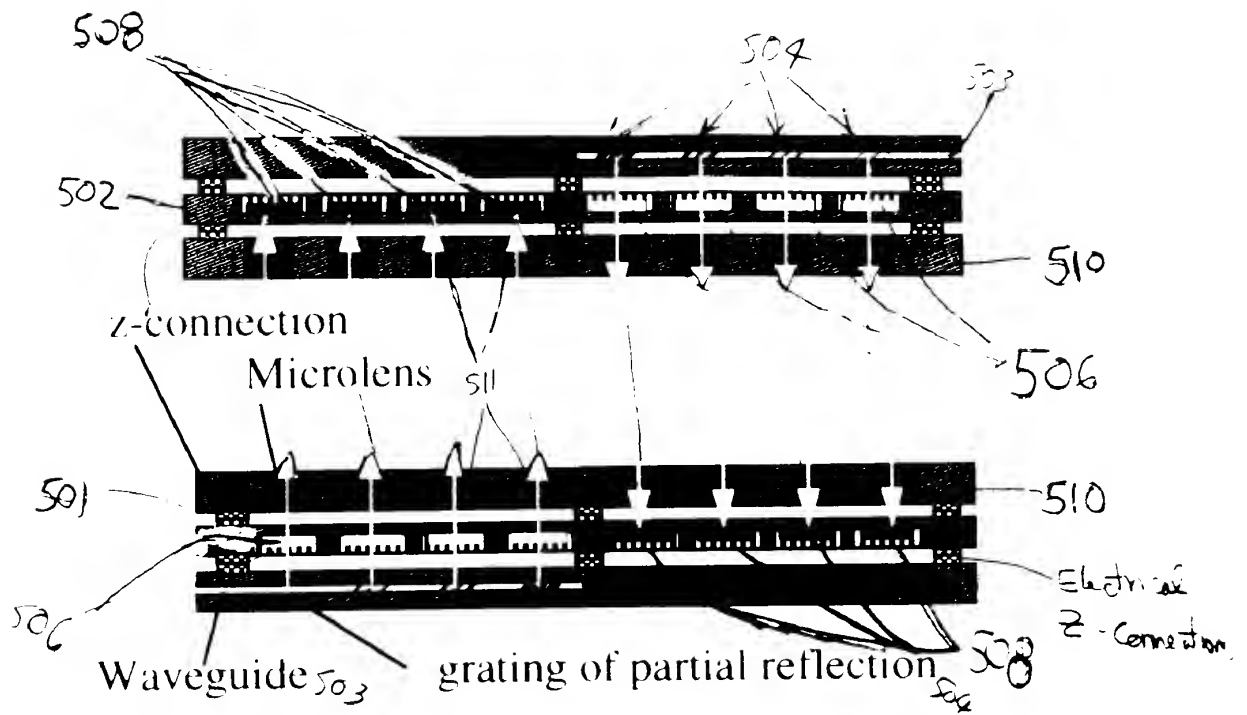


FIG. 69

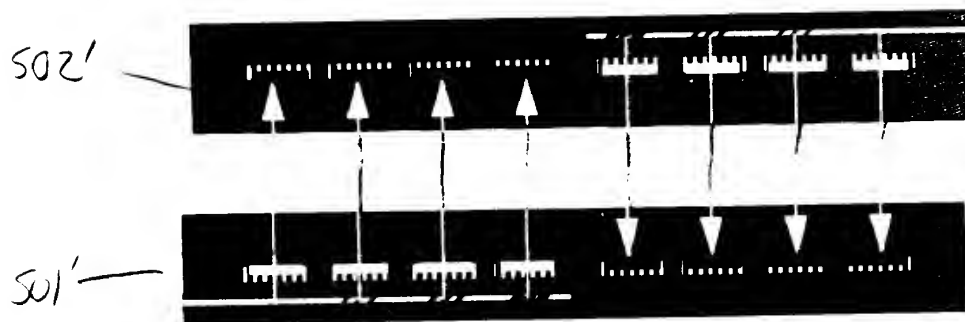


FIG. 70

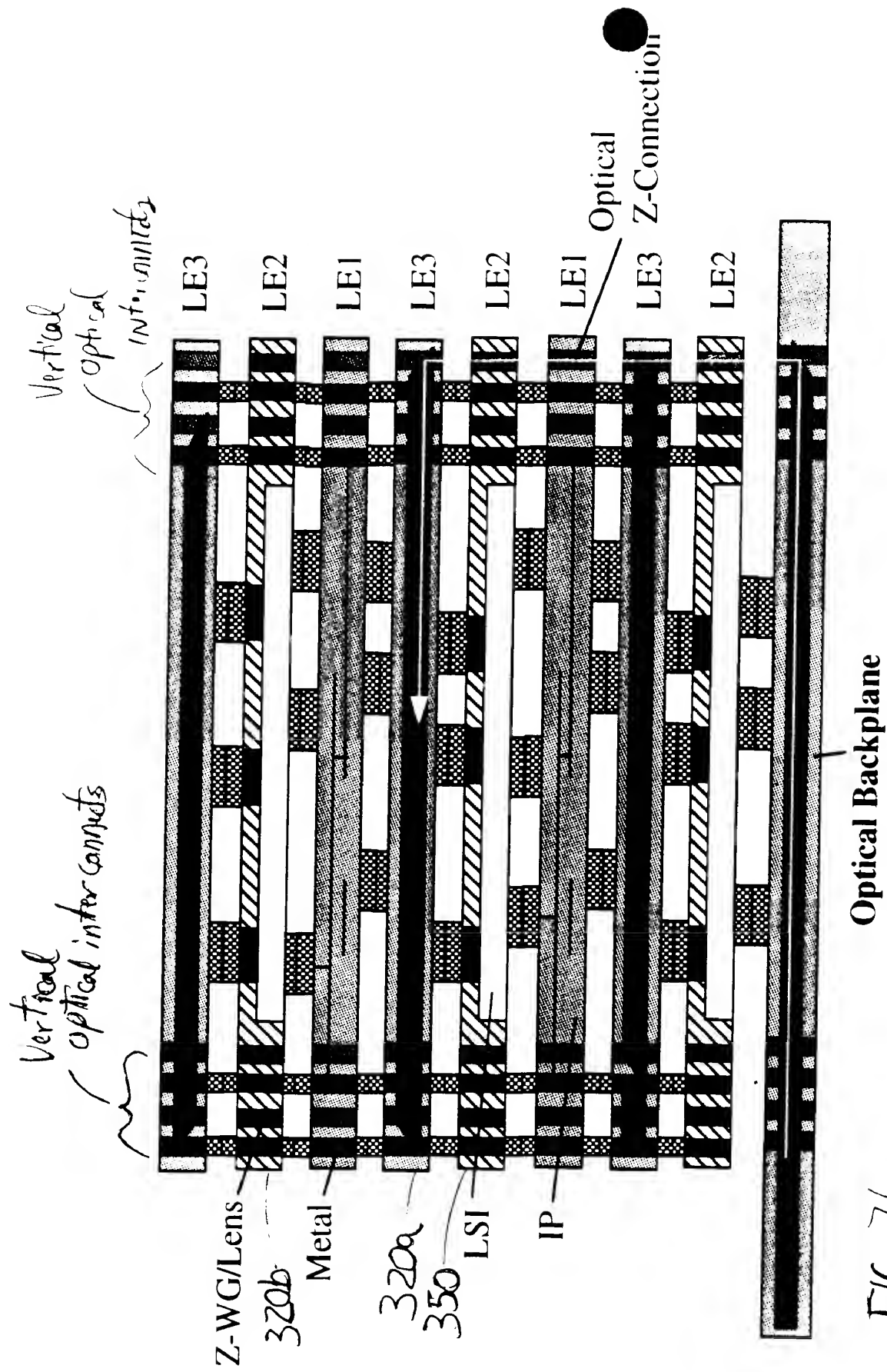


FIG. 71

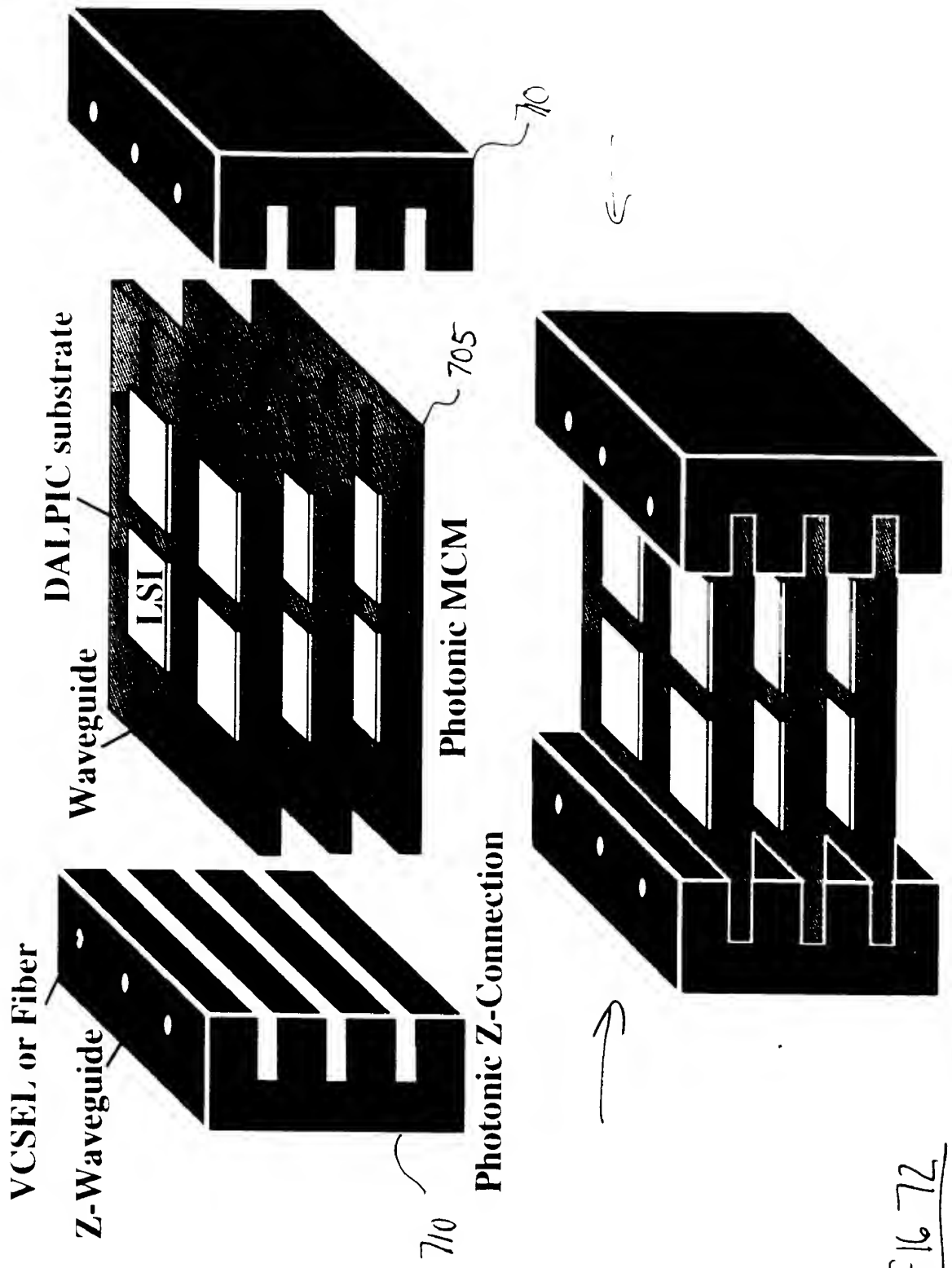
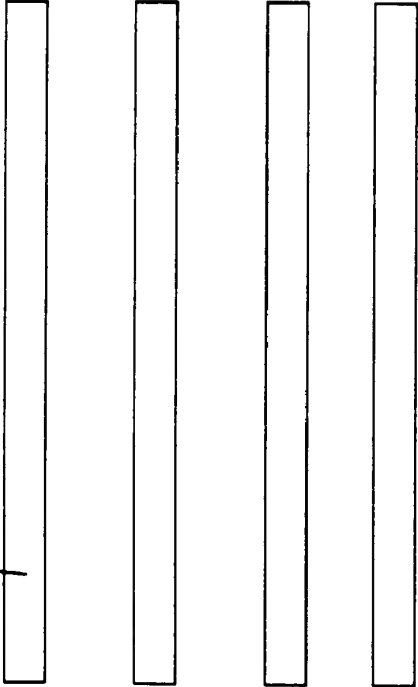
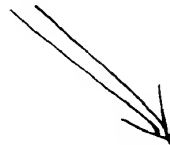
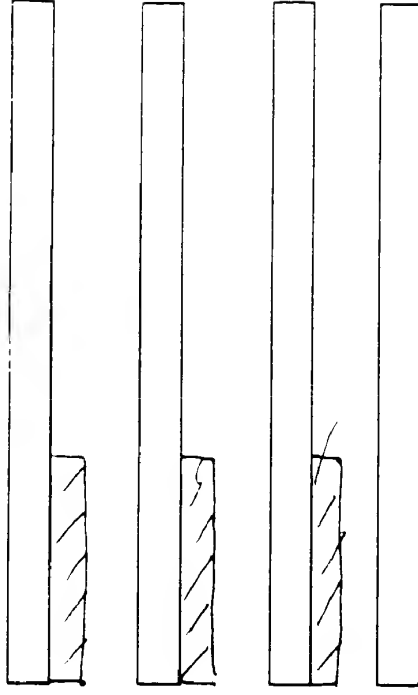


Fig 72

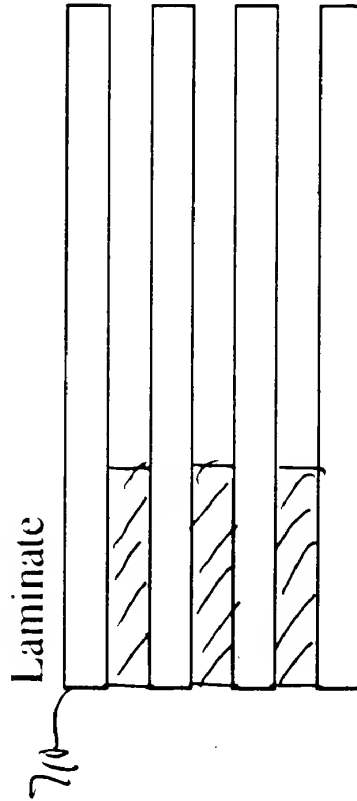
Flexible Photo-imagable sheet (Polyguide)



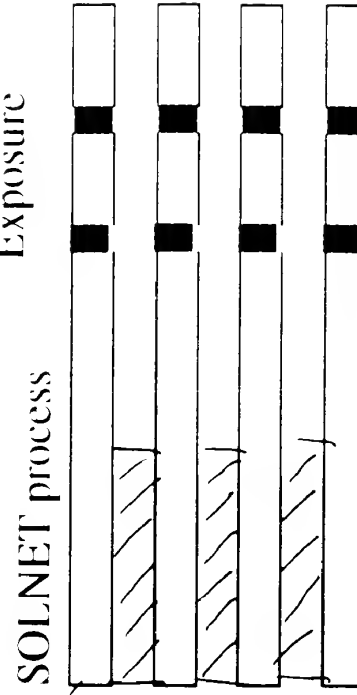
Bonding sheet attach



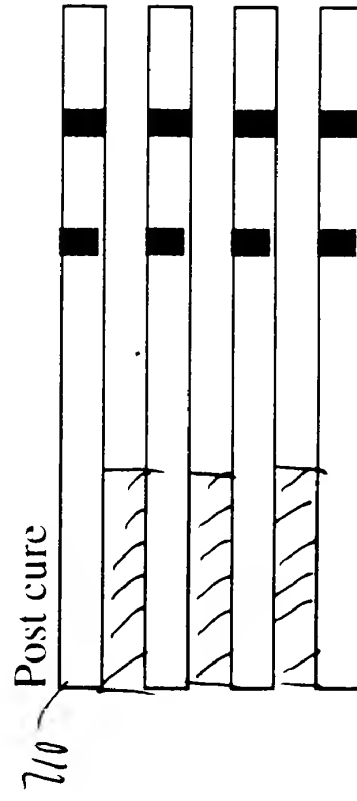
Laminate



Exposure



Post cure



Assemble

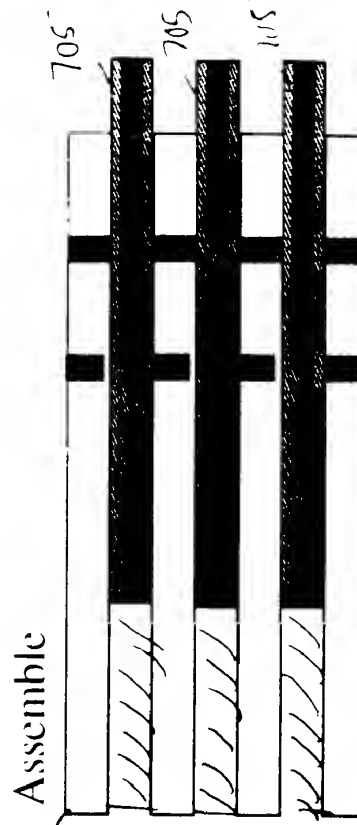


FIG. 73

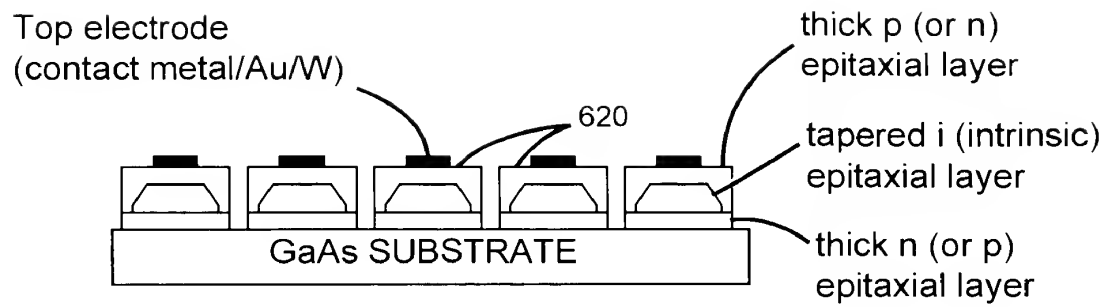


FIG._74 (Epitaxial growth and patterning)

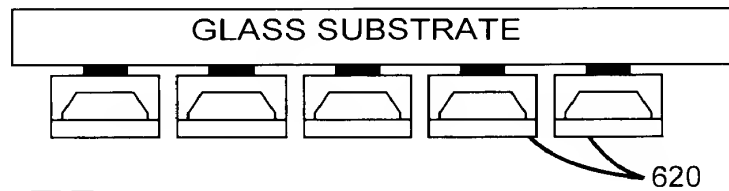


FIG._75 (Epitaxial lift-off)

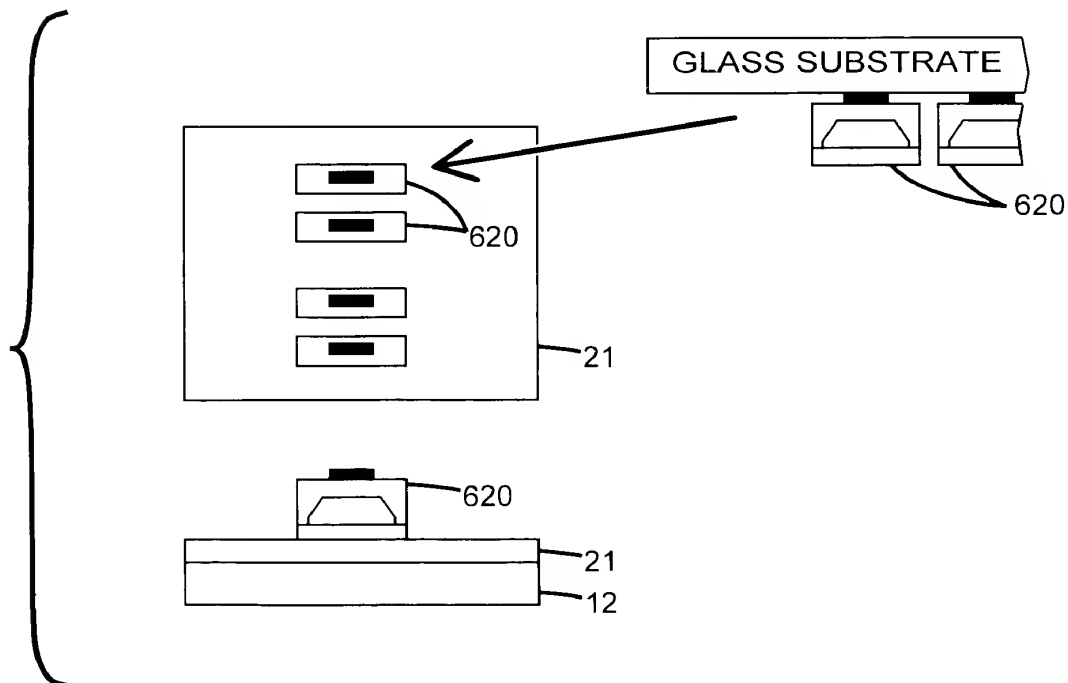


FIG._76 (Transfer)

Example of Light Modulator (or Photodetector) Integration

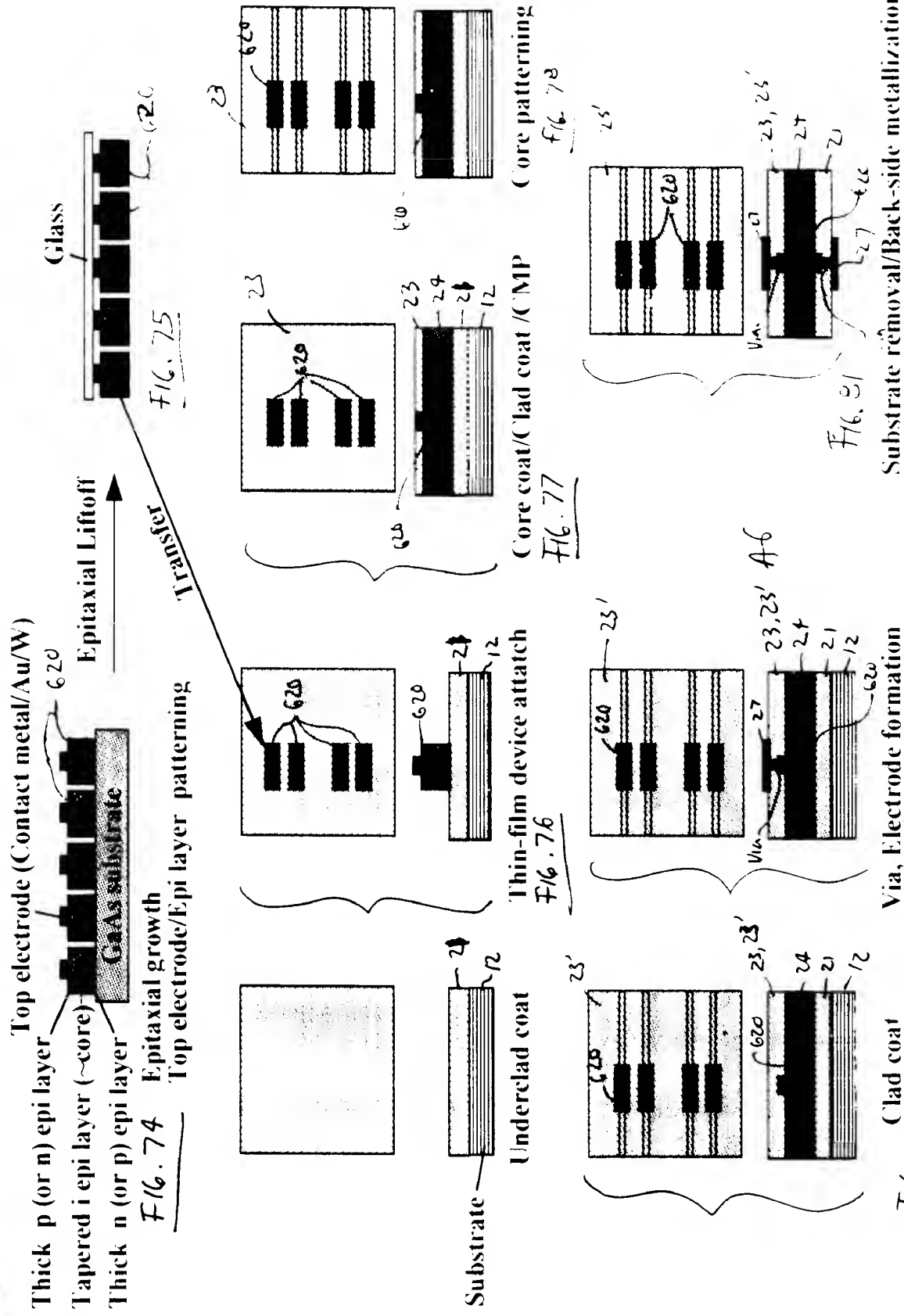


Fig. A6

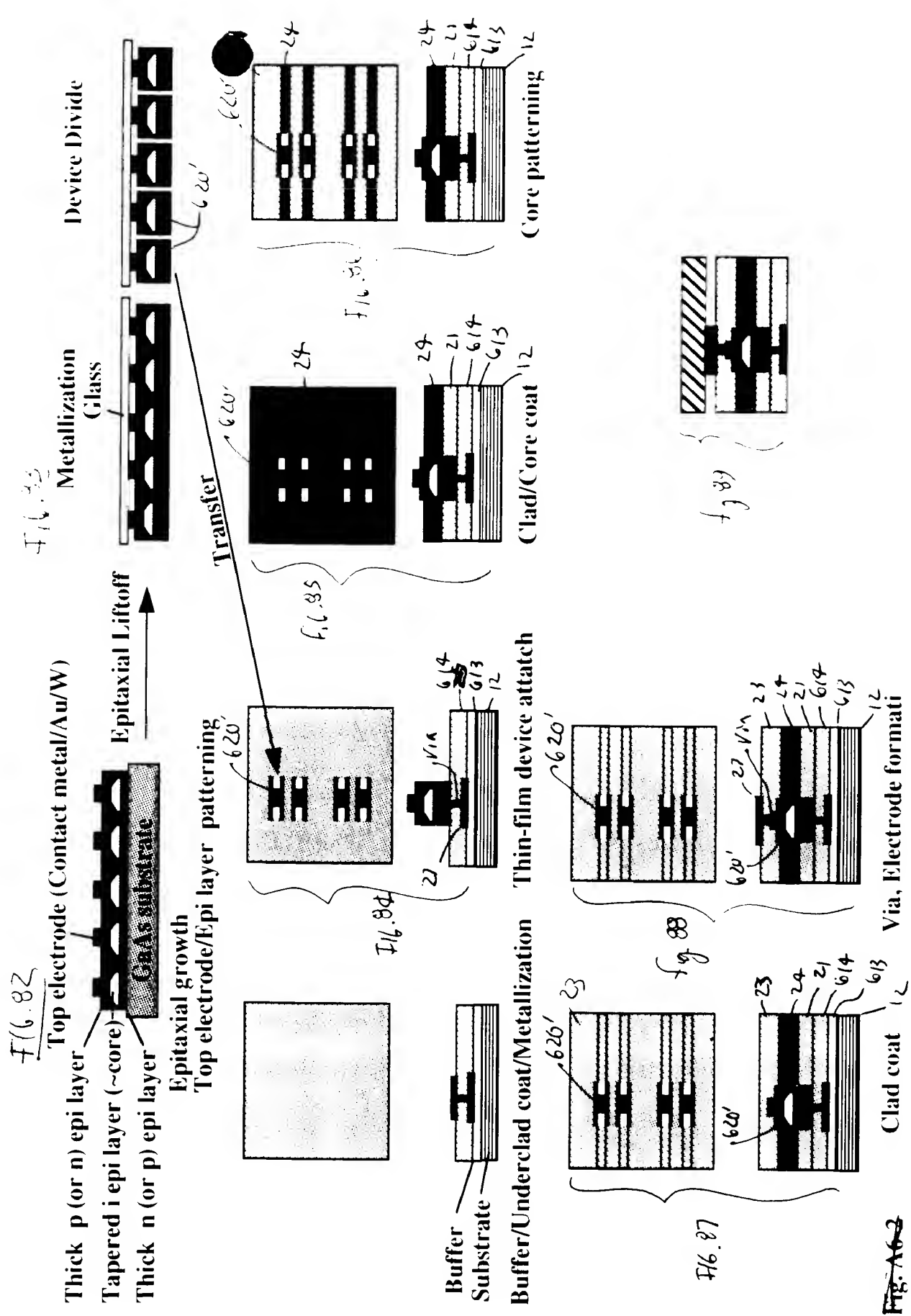
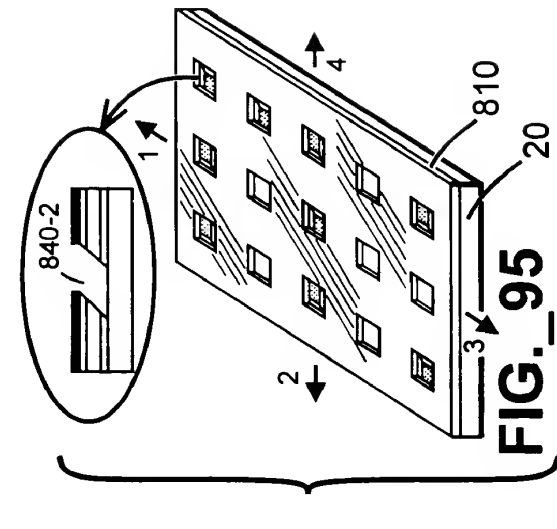
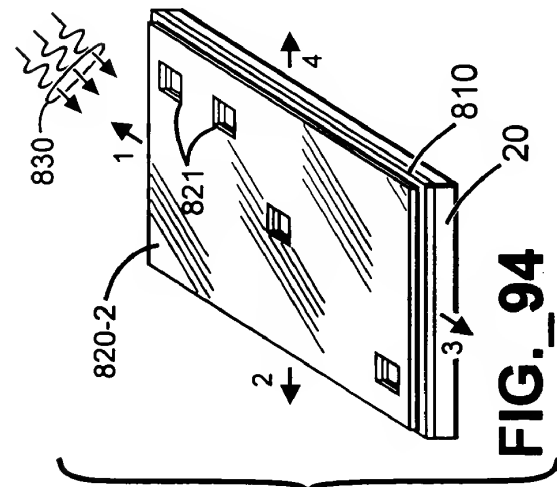
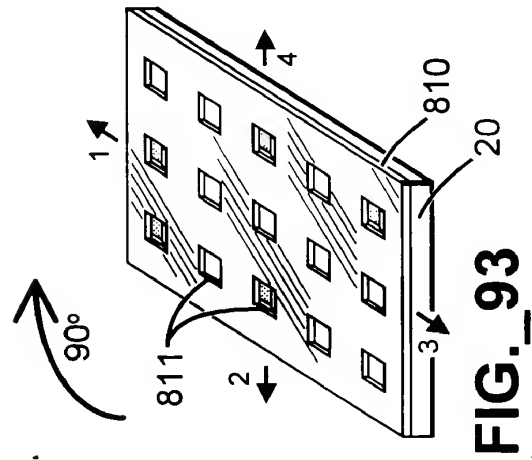
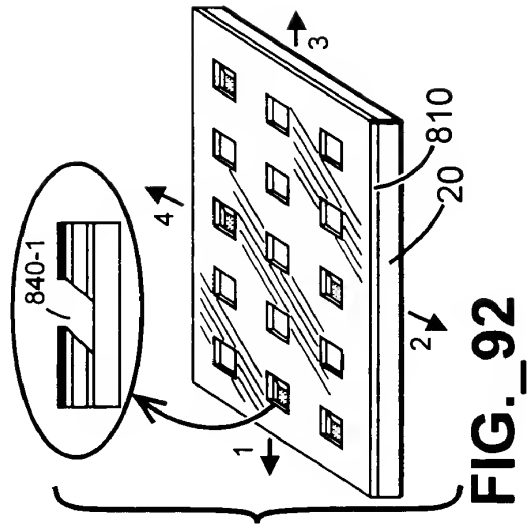
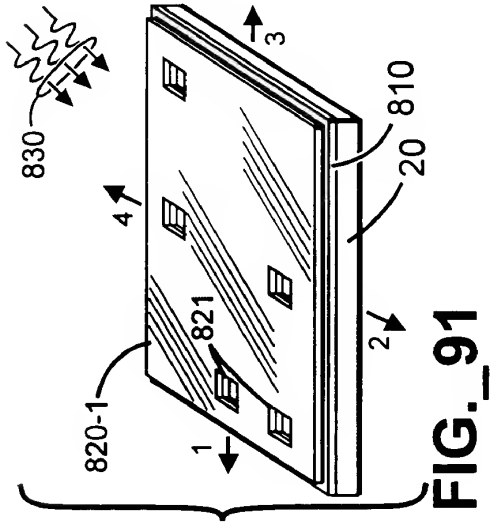
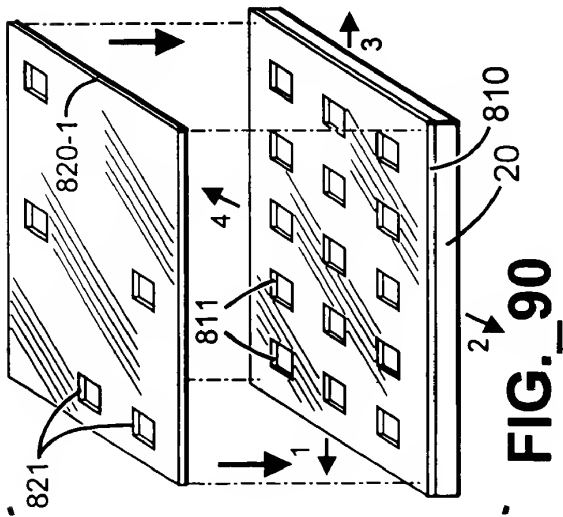
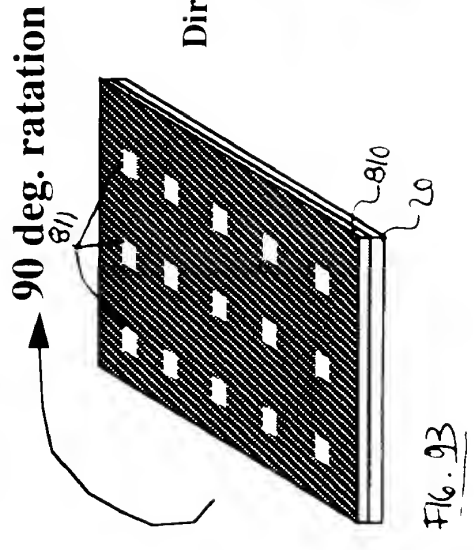
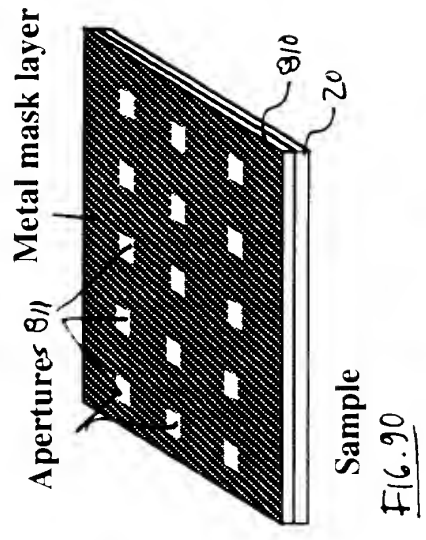
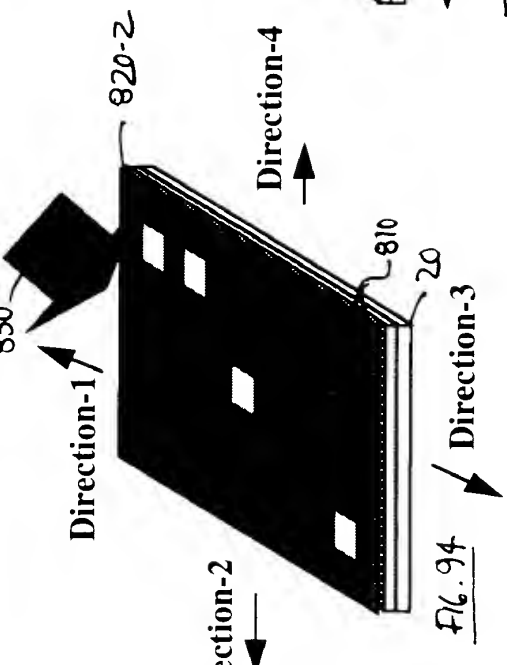
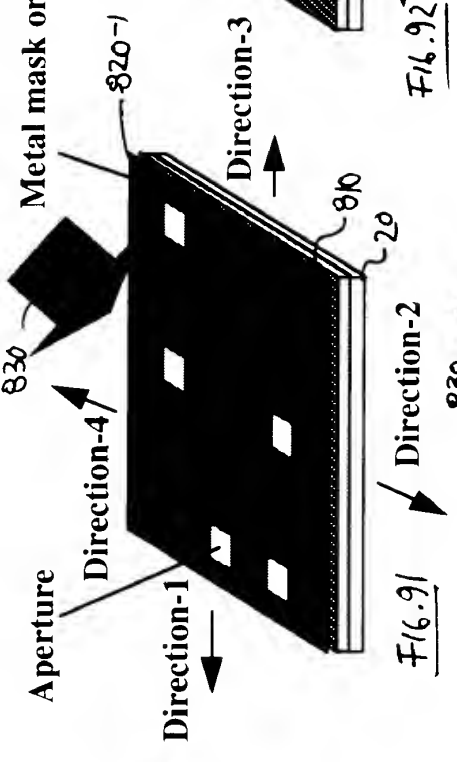
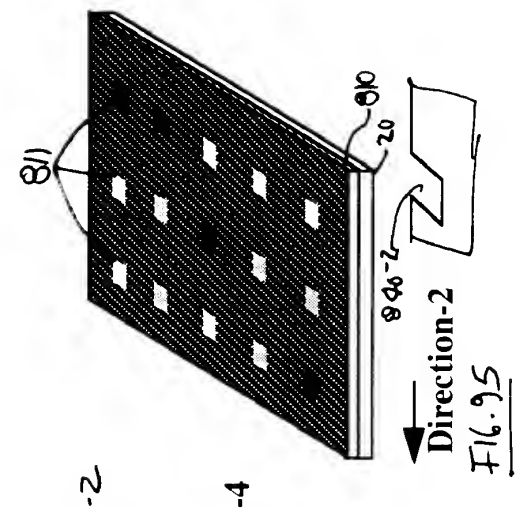
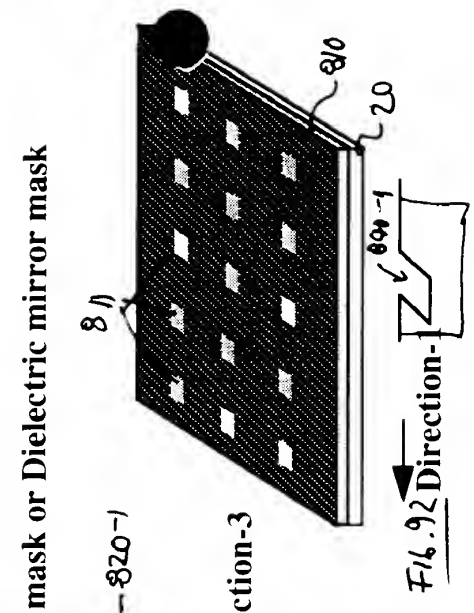


FIG. 82



Excimer laser with tilted incident angle



90 deg. rotation

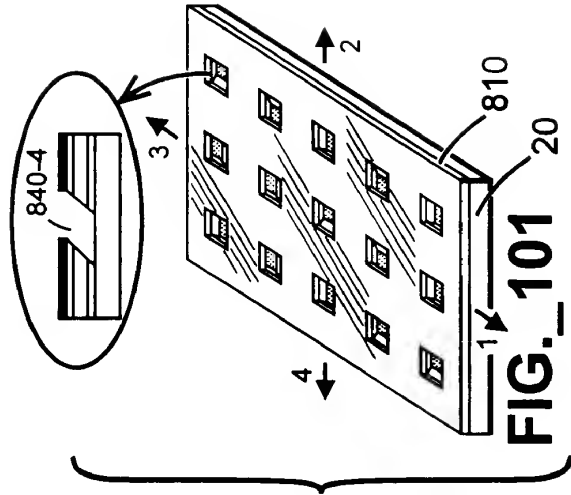
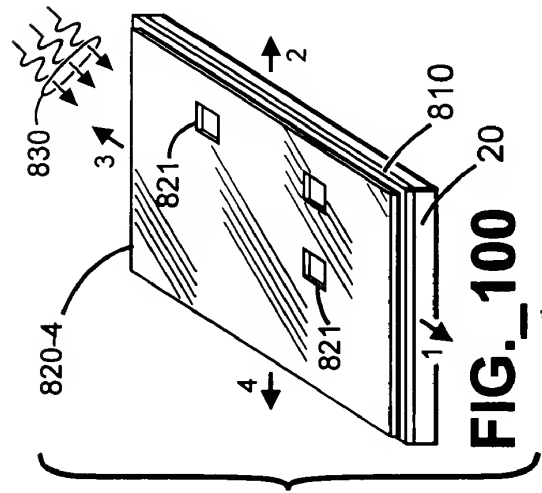
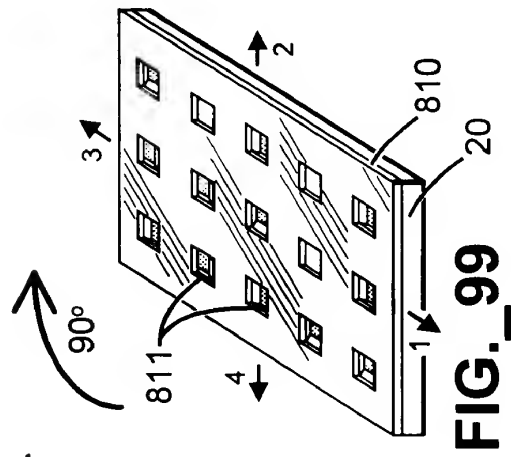
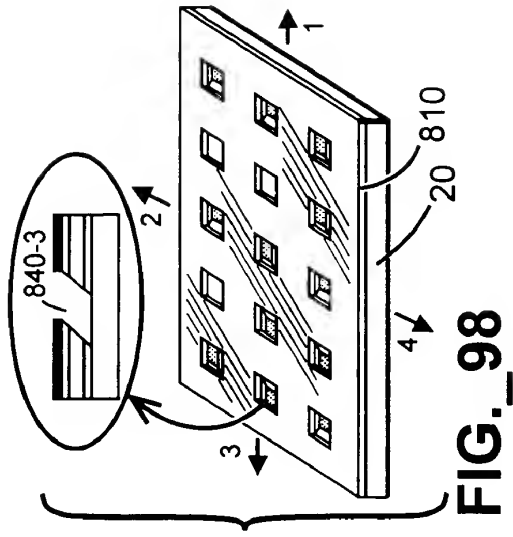
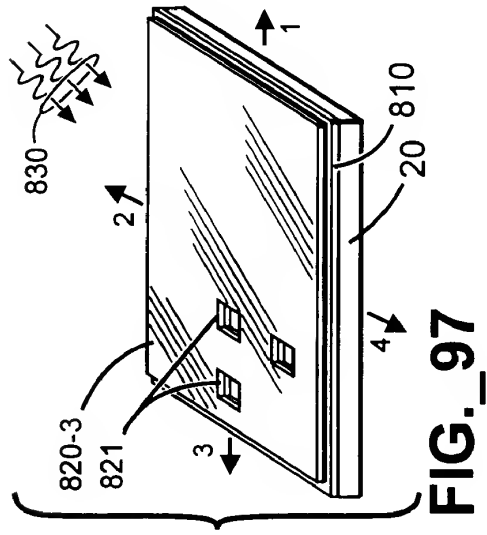
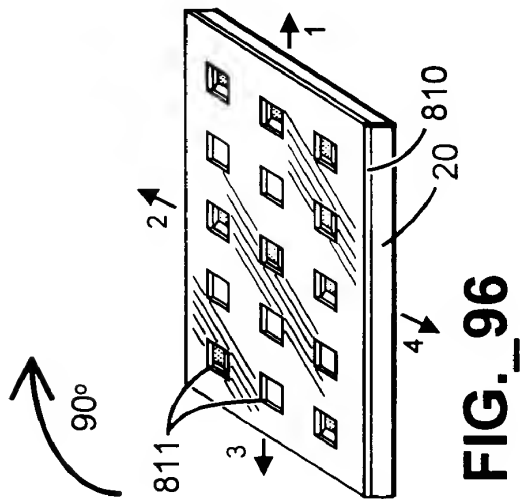
Fig. 93

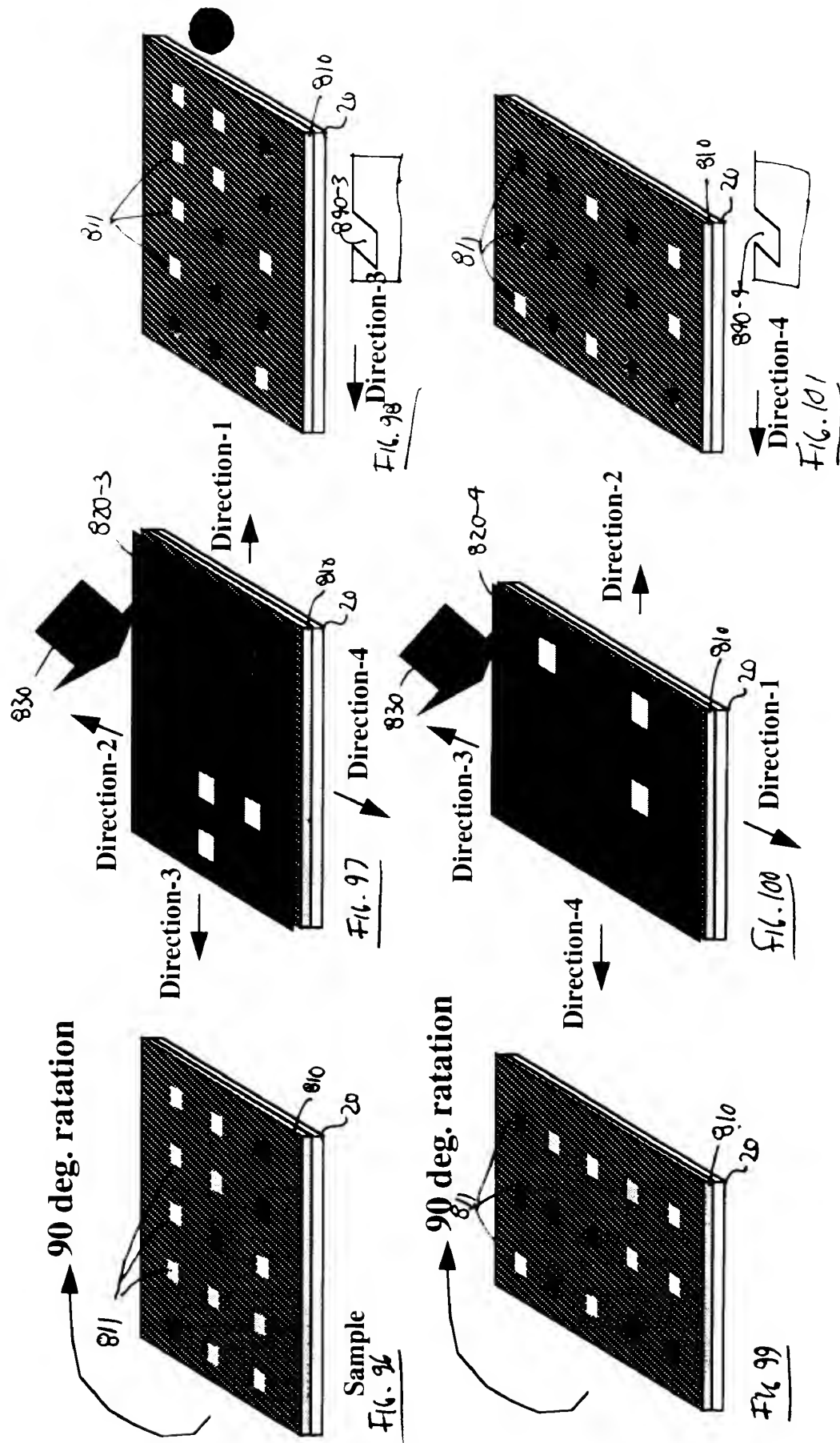
Fig. 94

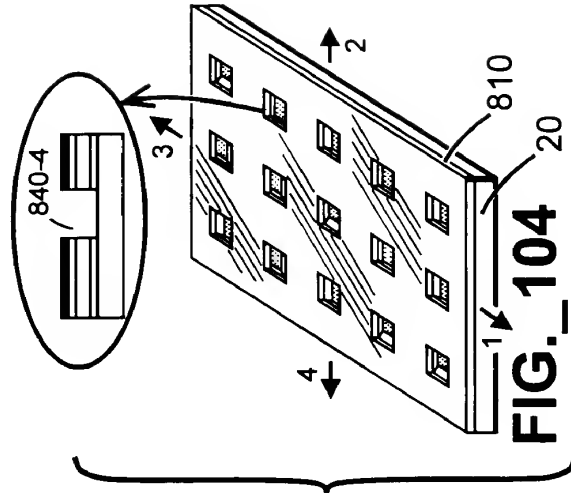
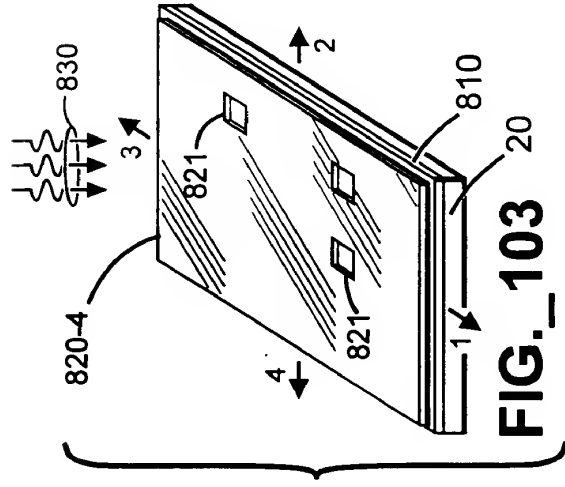
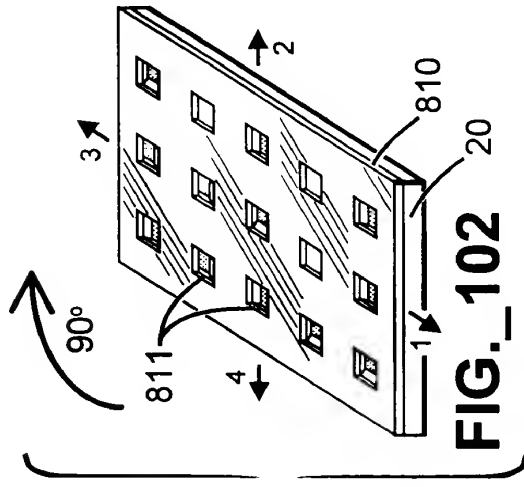
Fig. 95

Fig. 92

Fig. 91







90 deg. rotation

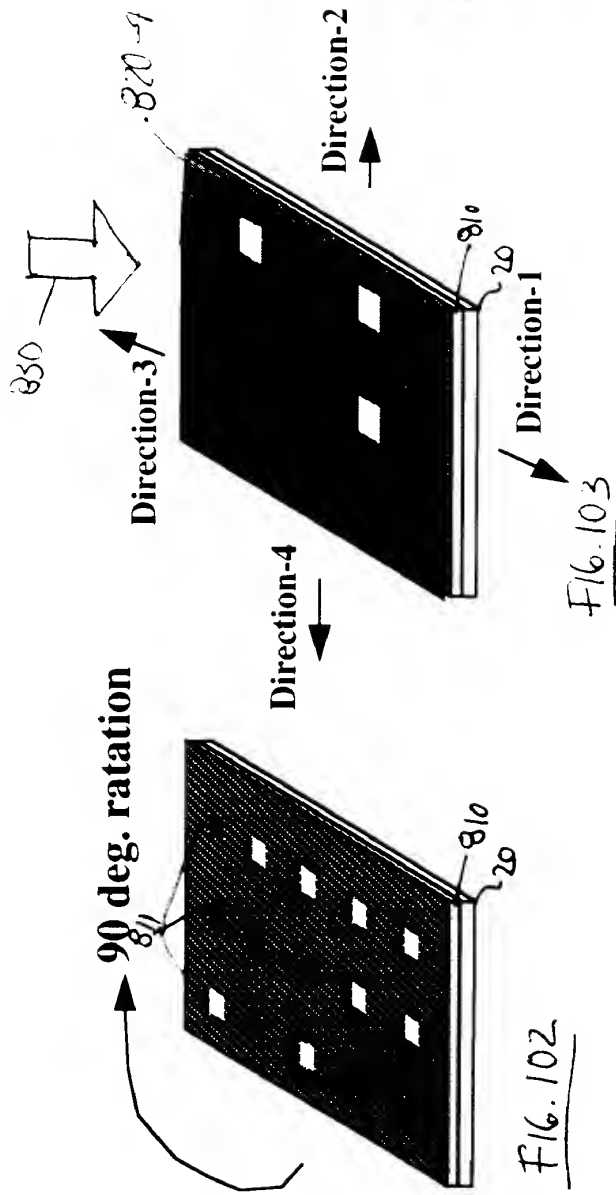


FIG. 102

FIG. 103

FIG. 104

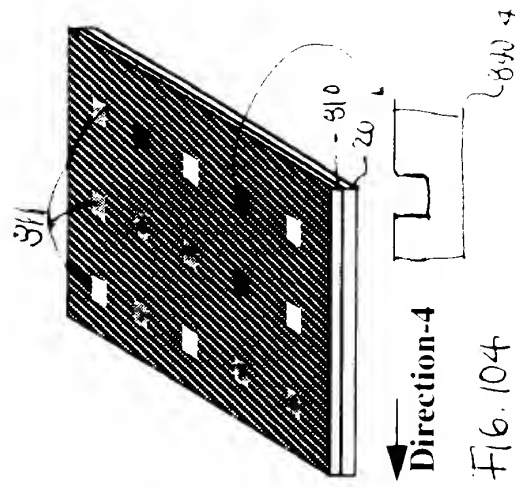
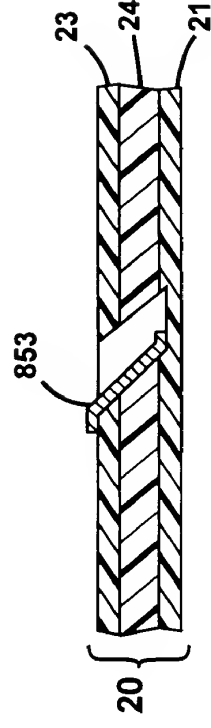
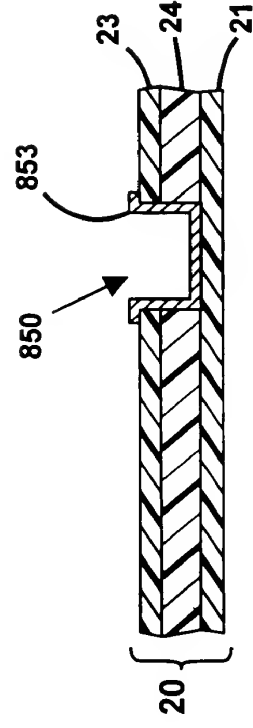
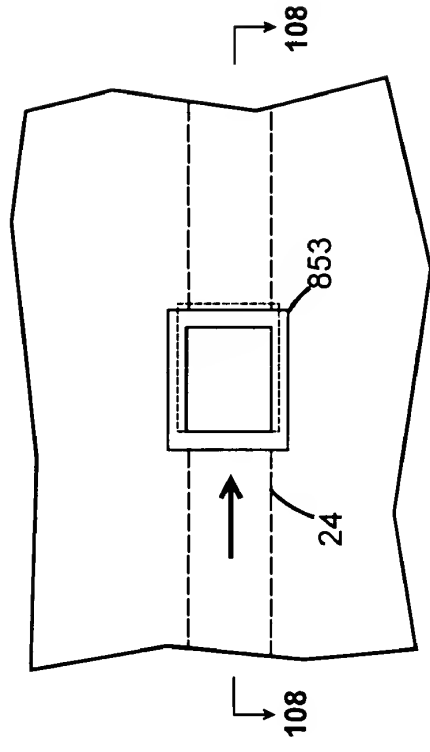
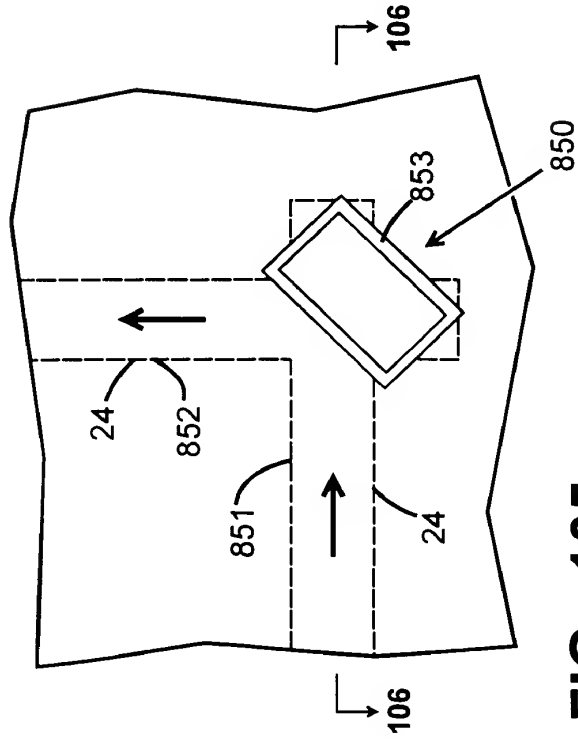


FIG. 104



852

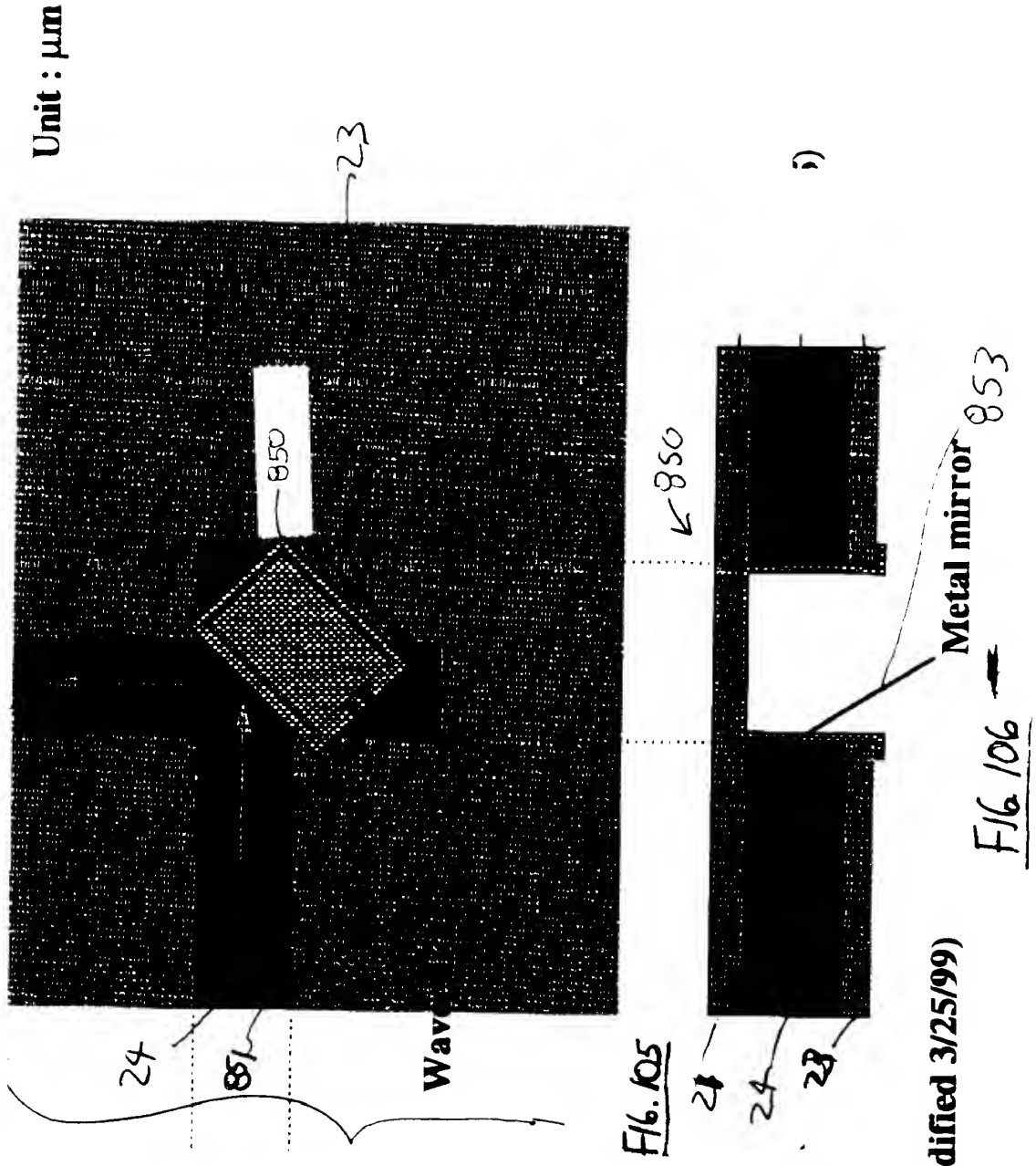


Fig. 3/24/99-1 (Modified 3/25/99)

cl 3/25/99

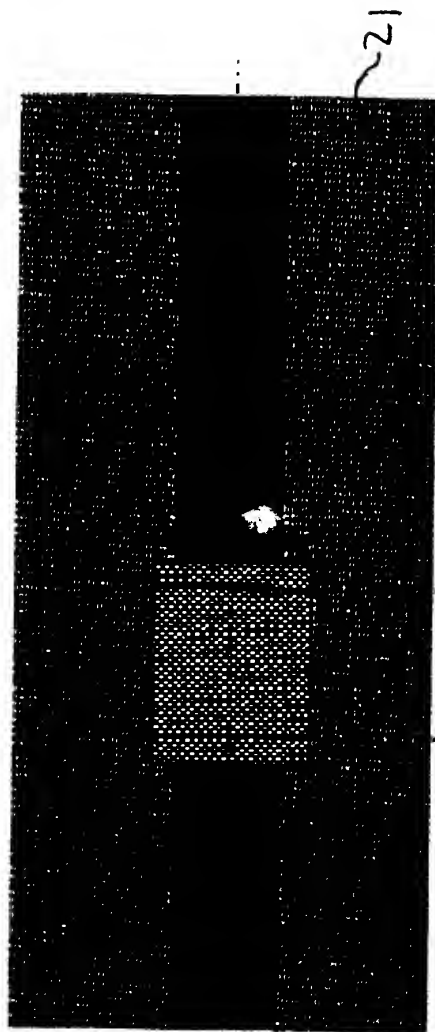


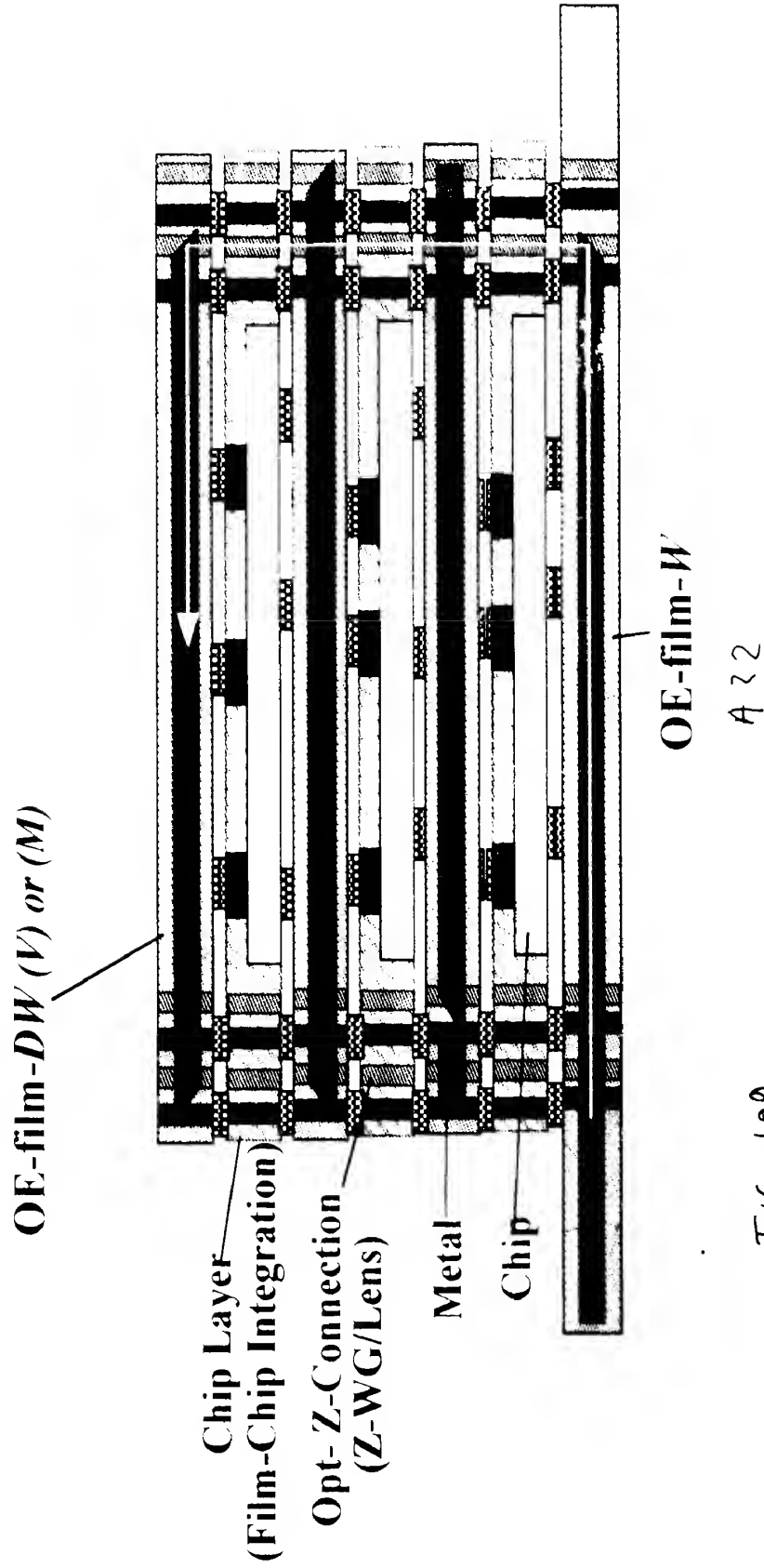
FIG. 107



FIG. 108

Metal mirror

GS CX/CXX OE Solution --- OE-3D-Stack



2/23/99-added 7

Figure 12-1

A 22 3/7/99

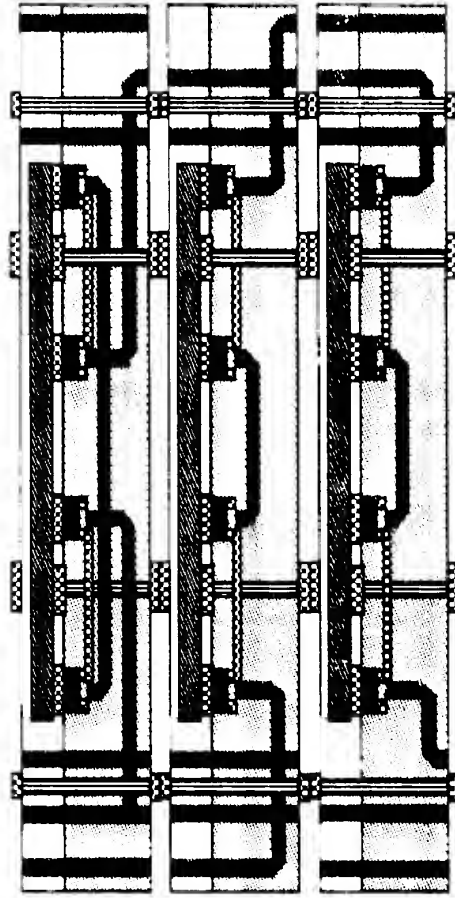
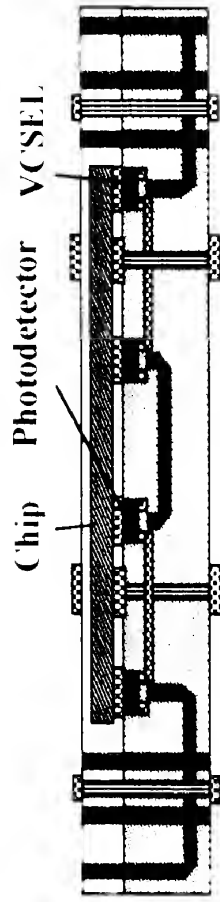


Fig. 110

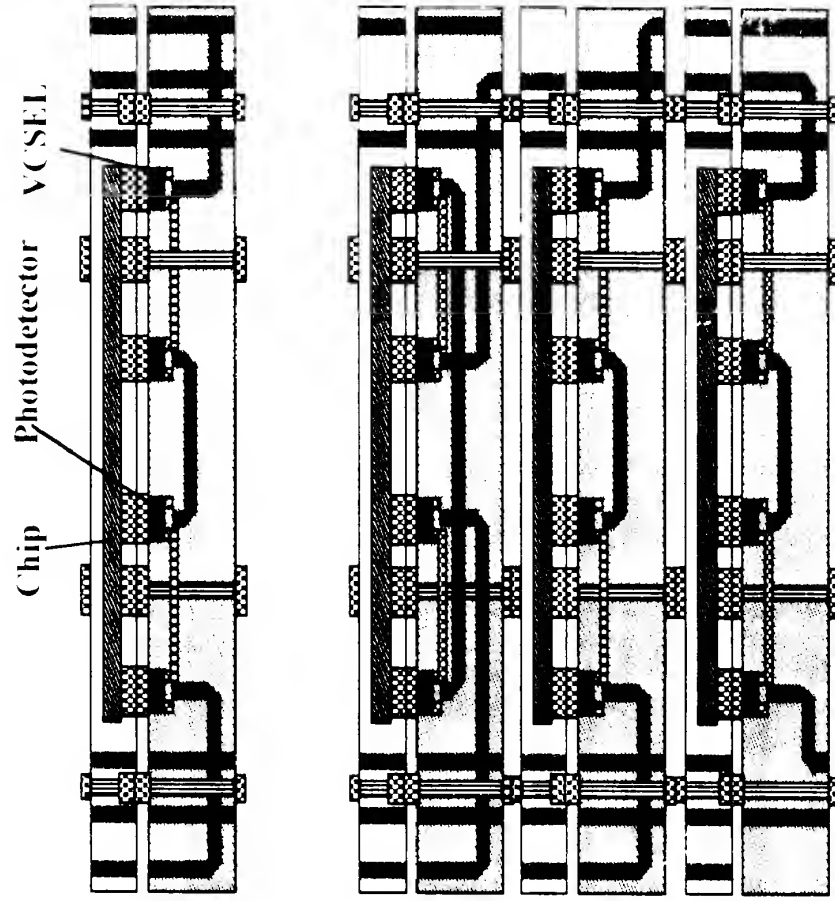
A23

(2/23/99) AA1 Detail picture Example for 3D-stack'

(New version of the AA1 of 2/5/99)

Figure 12-2'

A 23 3/7/99



F16.110

A24

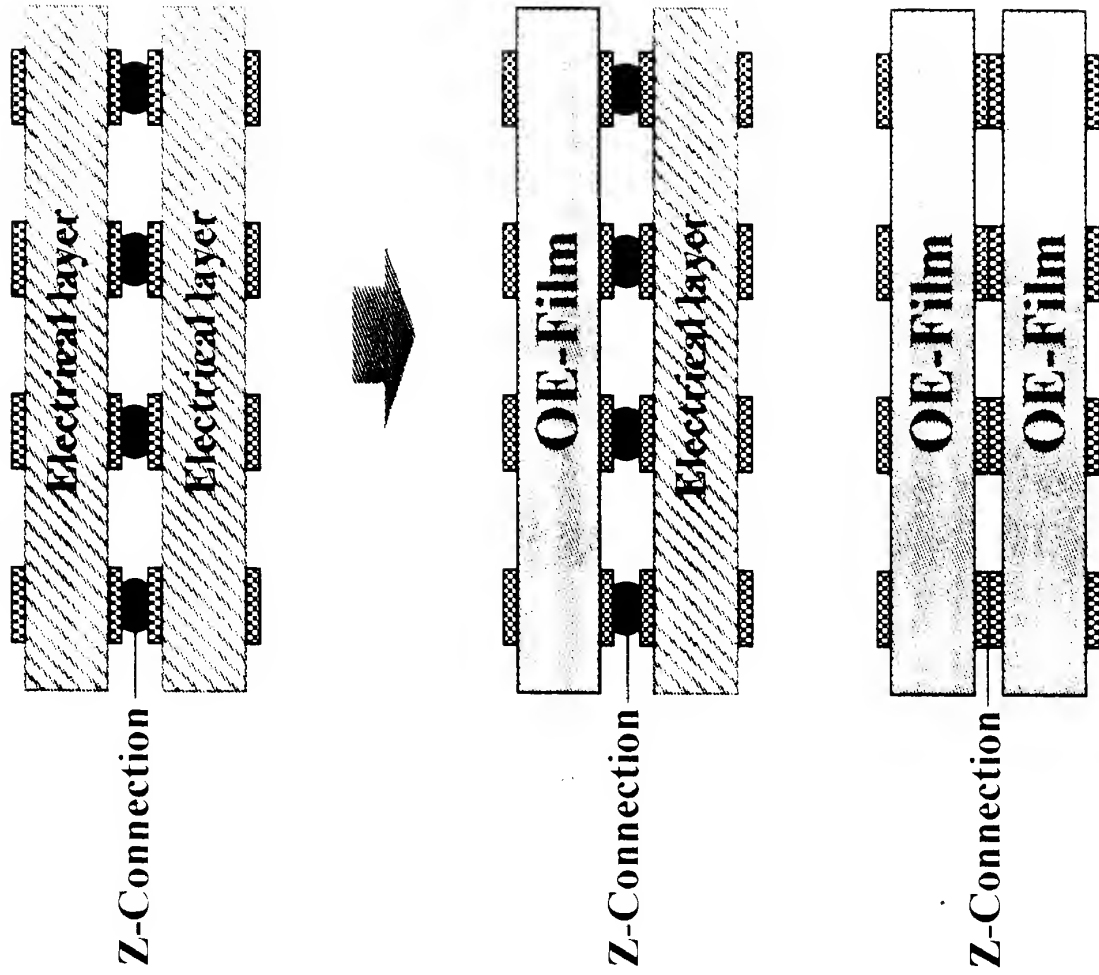
(2/23/99) AA2 Detail picture Example for 3D-stack'

(New version of the AA2 of 2/5/99)

Figure 12-3'

A24 3/7/99

Film/Z-Connection Application to OE-Substrate



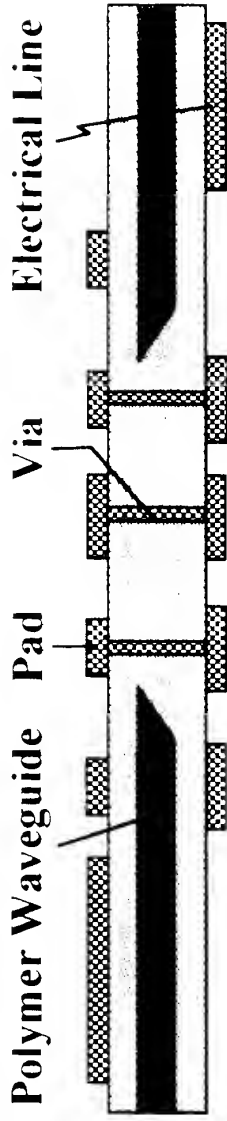
A7

2/23/99-added 1

Figure 1

A7 3/27/99

OE-Films



OE-film-W

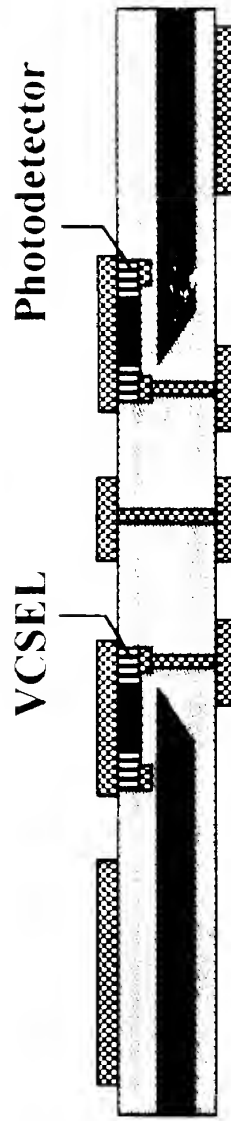
F16.113



OE-film-D

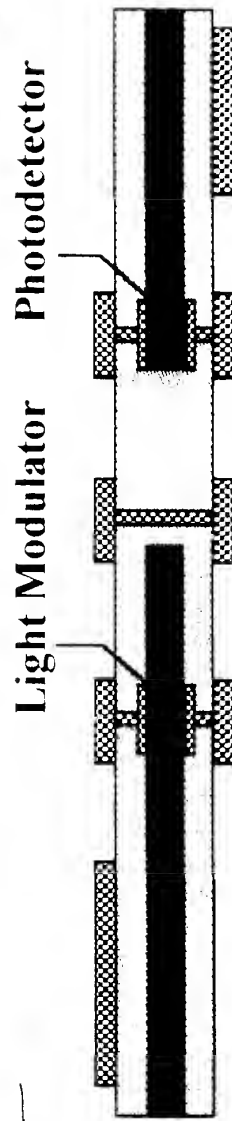
F16.114

A8



OE-film-DW(V)

F16.115



OE-film-DW(M)

2/17/99-added 2

F16.116

A8 3/27/99

Intgr
type



Figure 3-1

776.118

A9 317/99

FOLM

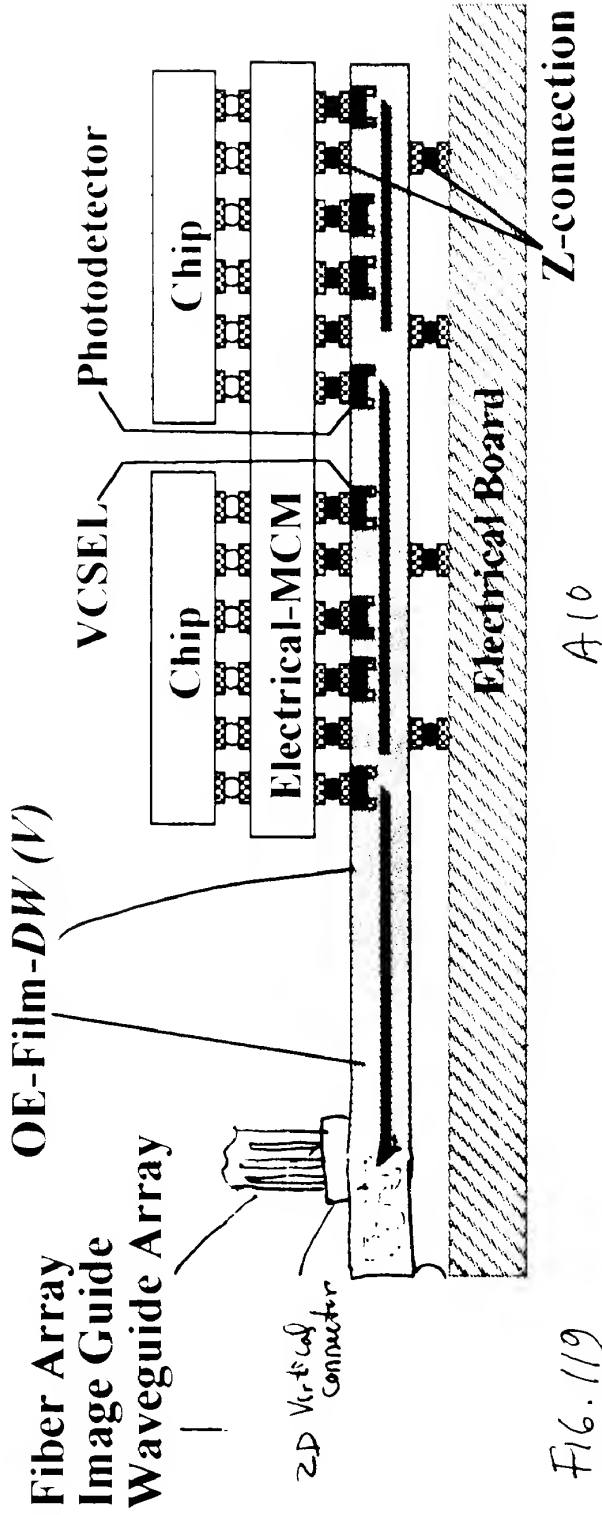
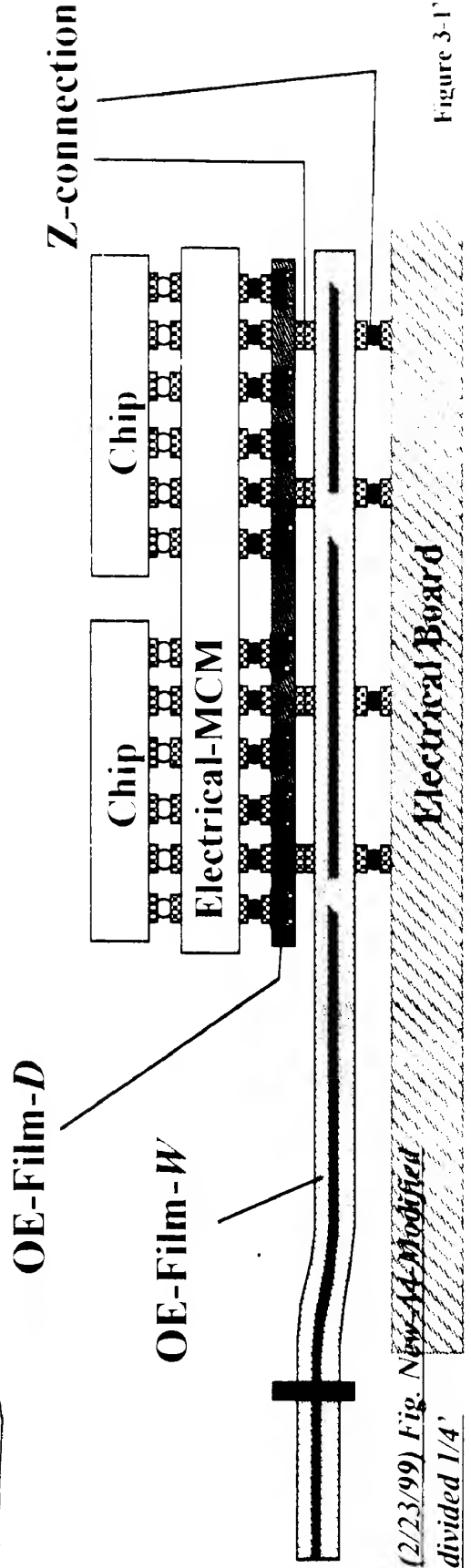


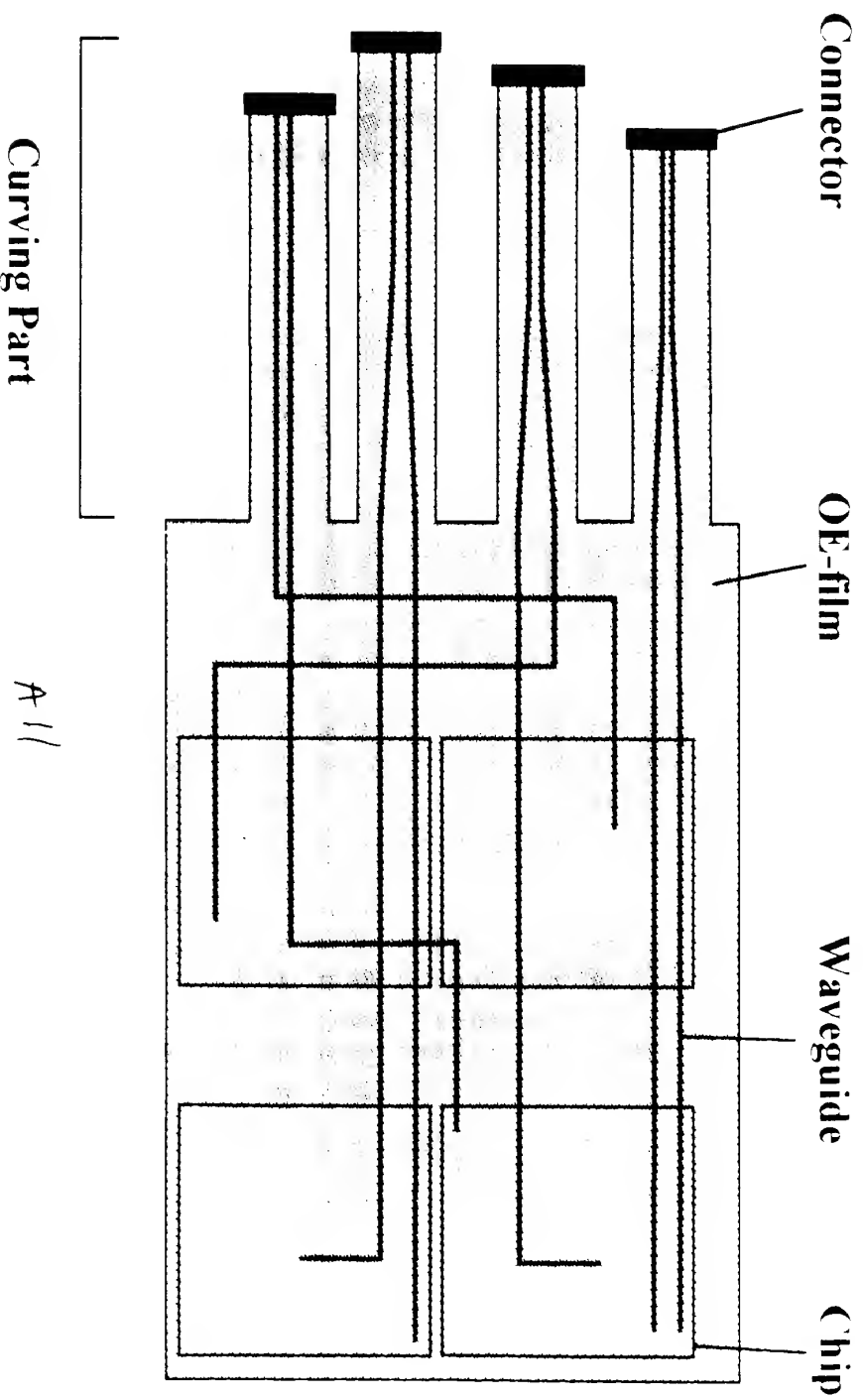
Fig. 119



(2/23/99) Fig. New-A4-Modified divided 1/4'

Figure 3-1'

FOLM with Optical Path Length Controller, Connector Buffer



(2/17/99) Fig. New-A4-Modified
divided 2/4

F/C. 121

A11 3/2/99

Figure 3-2

FOLM with Optical Path Length Controller, Connector Buffer

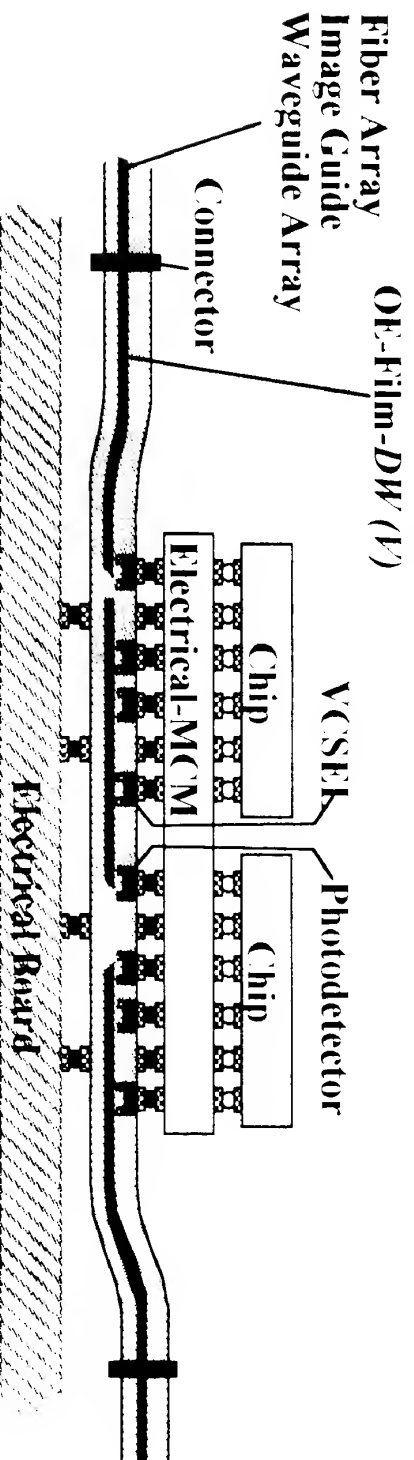


Fig. 123

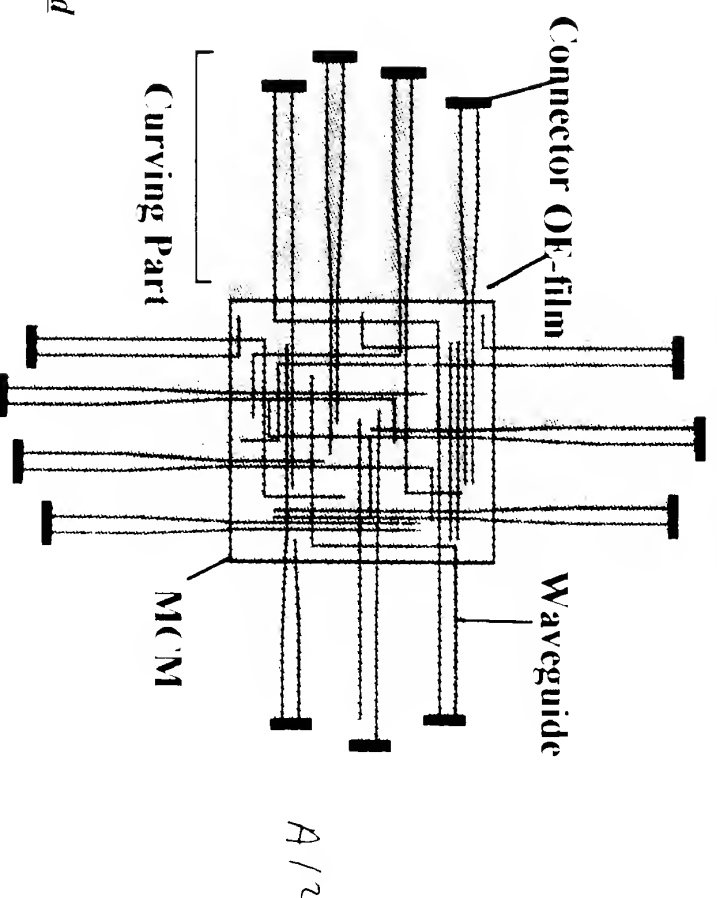


Fig. 122

(2/23/99) Fig. New-A4-Modified
divided 2/4'

Figure 3-2'

FOLM with 2D Waveguide Connector

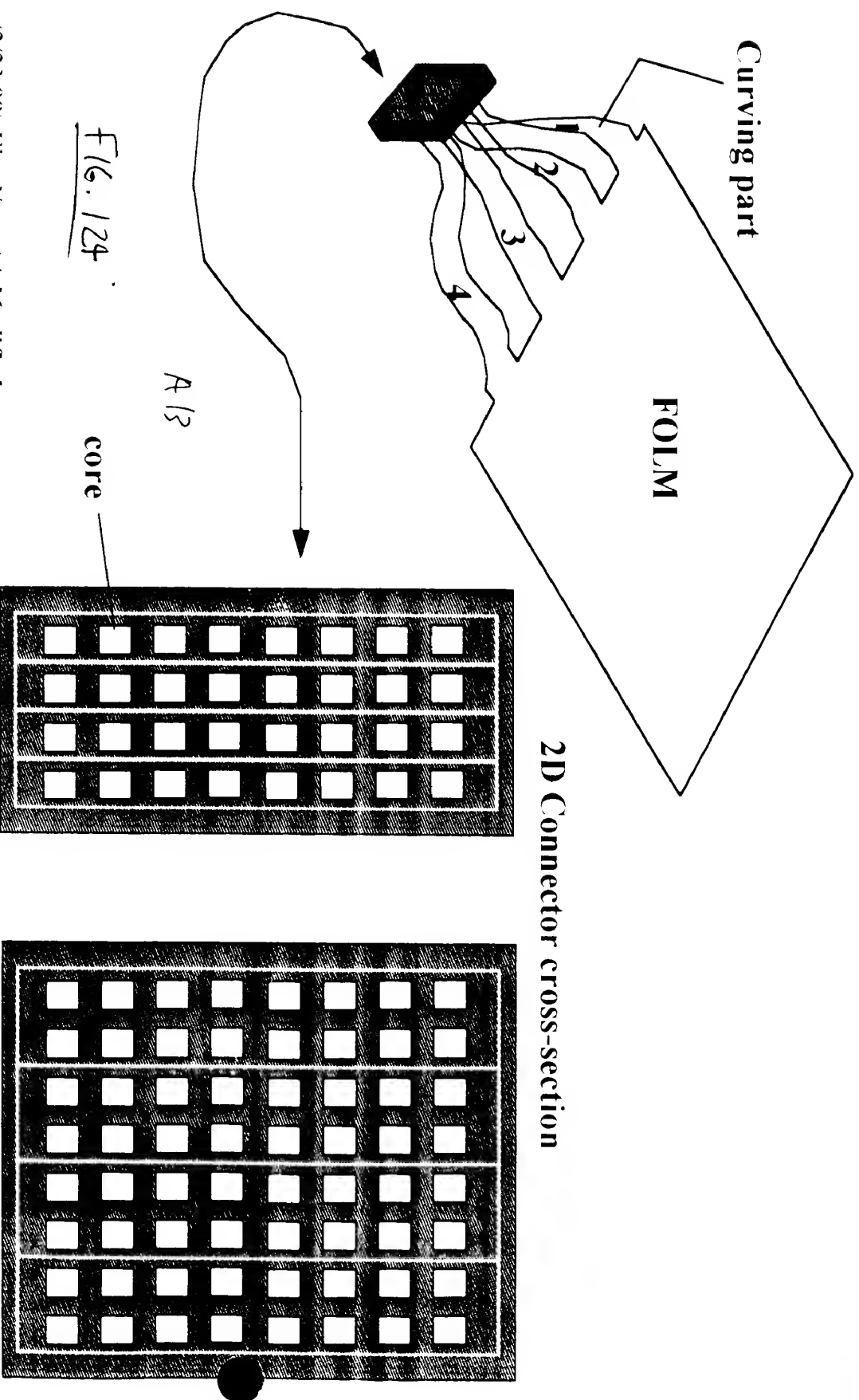


FIG. 124

(2/23/99) Fig. New-A4-Modified
divided 3/4'

(for Single-layer waveguide) (for 2-layer waveguide) Figure 3-3'

A M3 3/7/99

FOLM: High-Speed Option

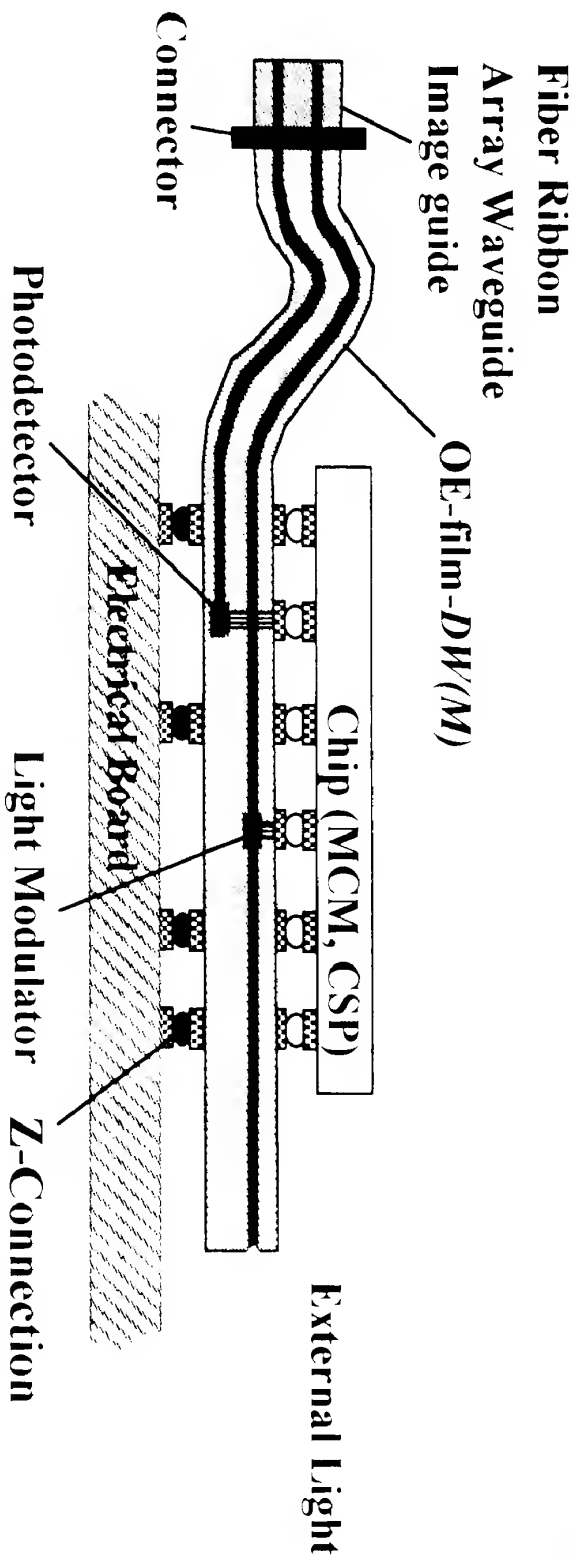


Fig. 125

A 14

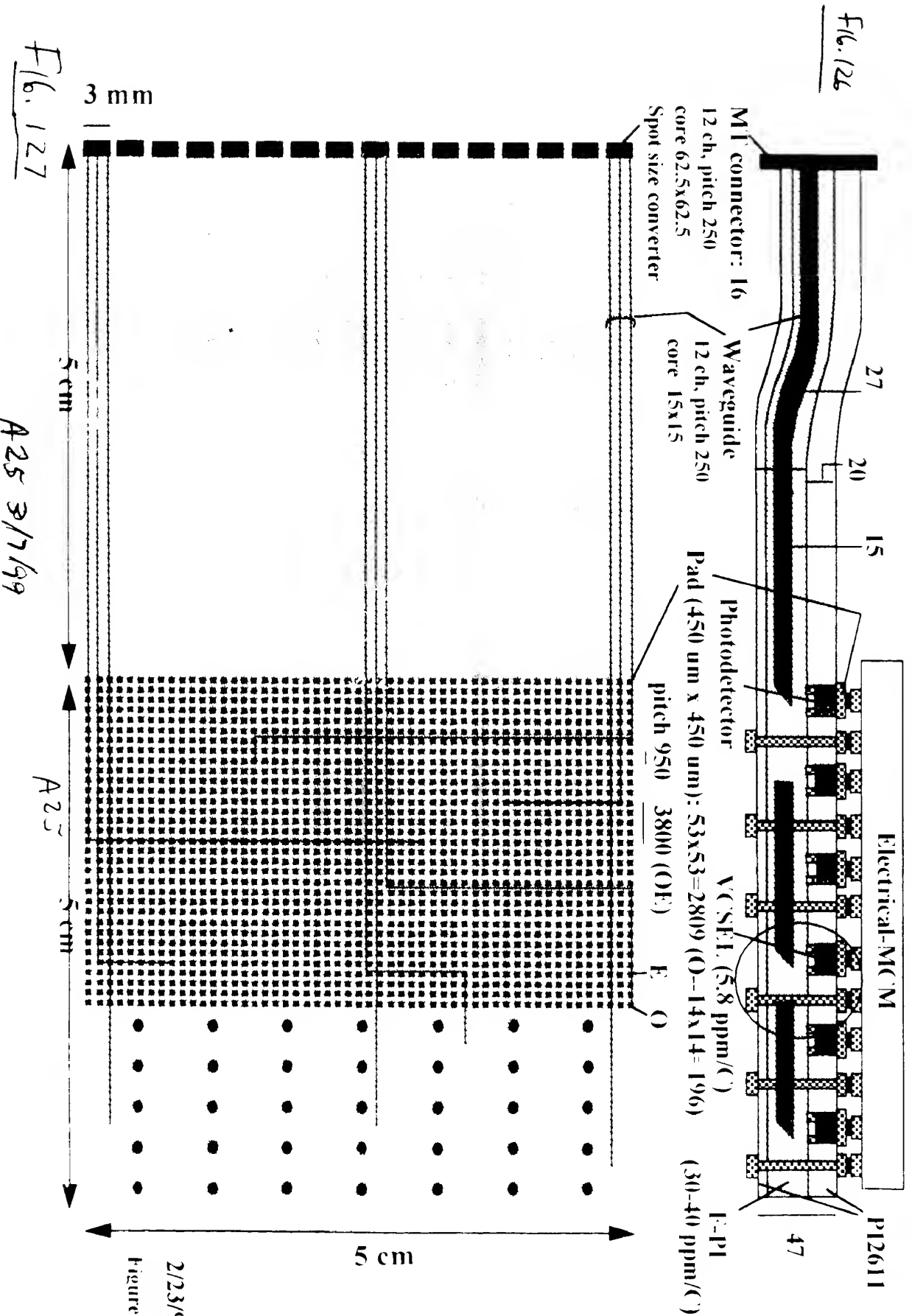
(2/17/99) Fig. New-A4-Modified
divided 4/4

A 14 3/7/99

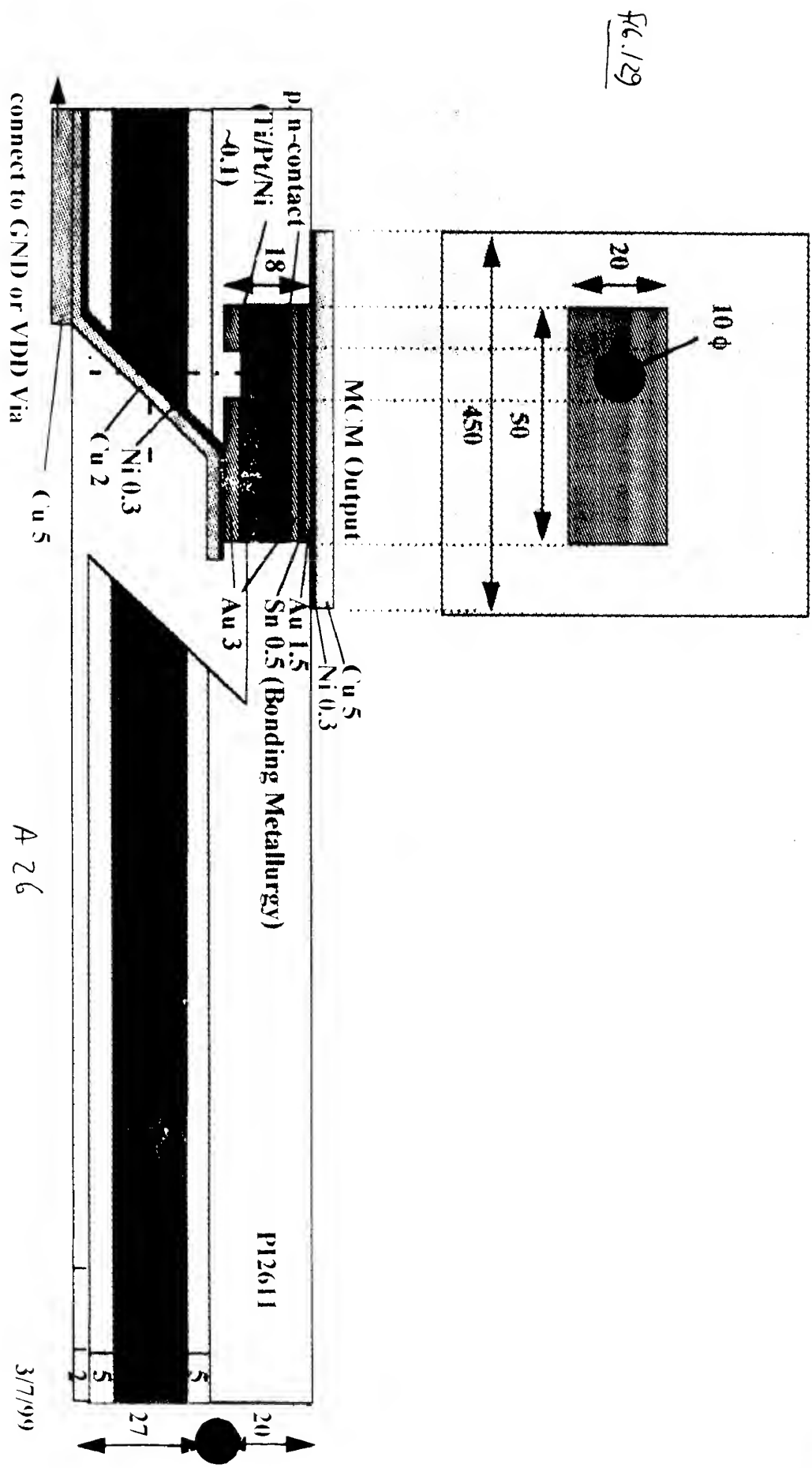
FOLM Structure Example (Overall)

Through put: 1.5 pbs x 196 ch Assume SSX MCM Size is ~5 cm x 5 cm

Unit: μm



FOLM Structure Example (VCSEL part)



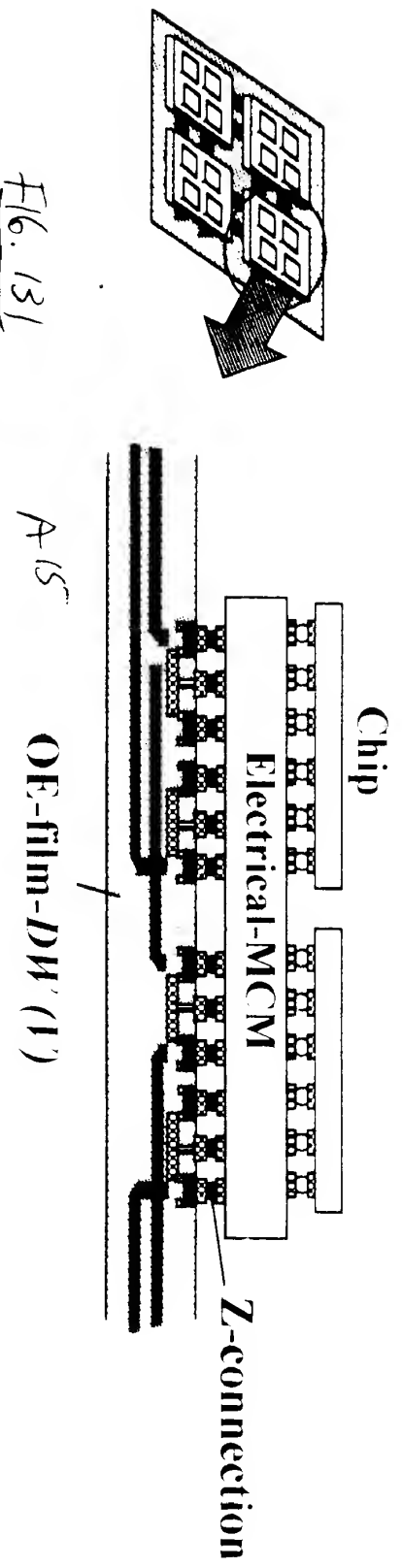
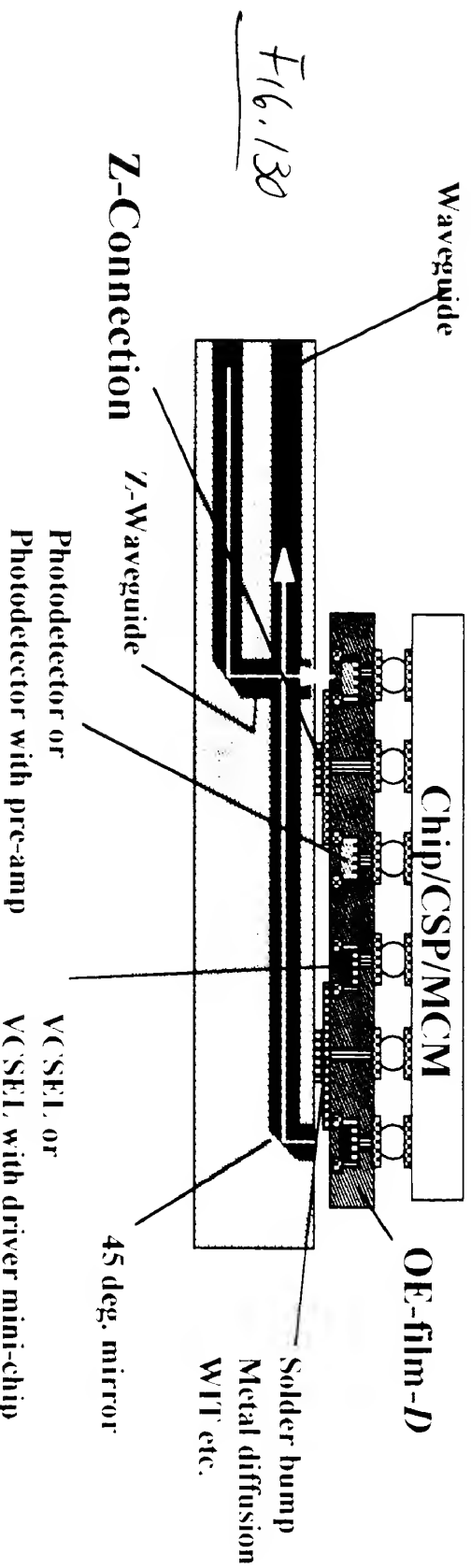
F6.128

Unit : μm

Figure 14

A26 3/7/99

OE-film: OE-IP, OE-Film-MCM



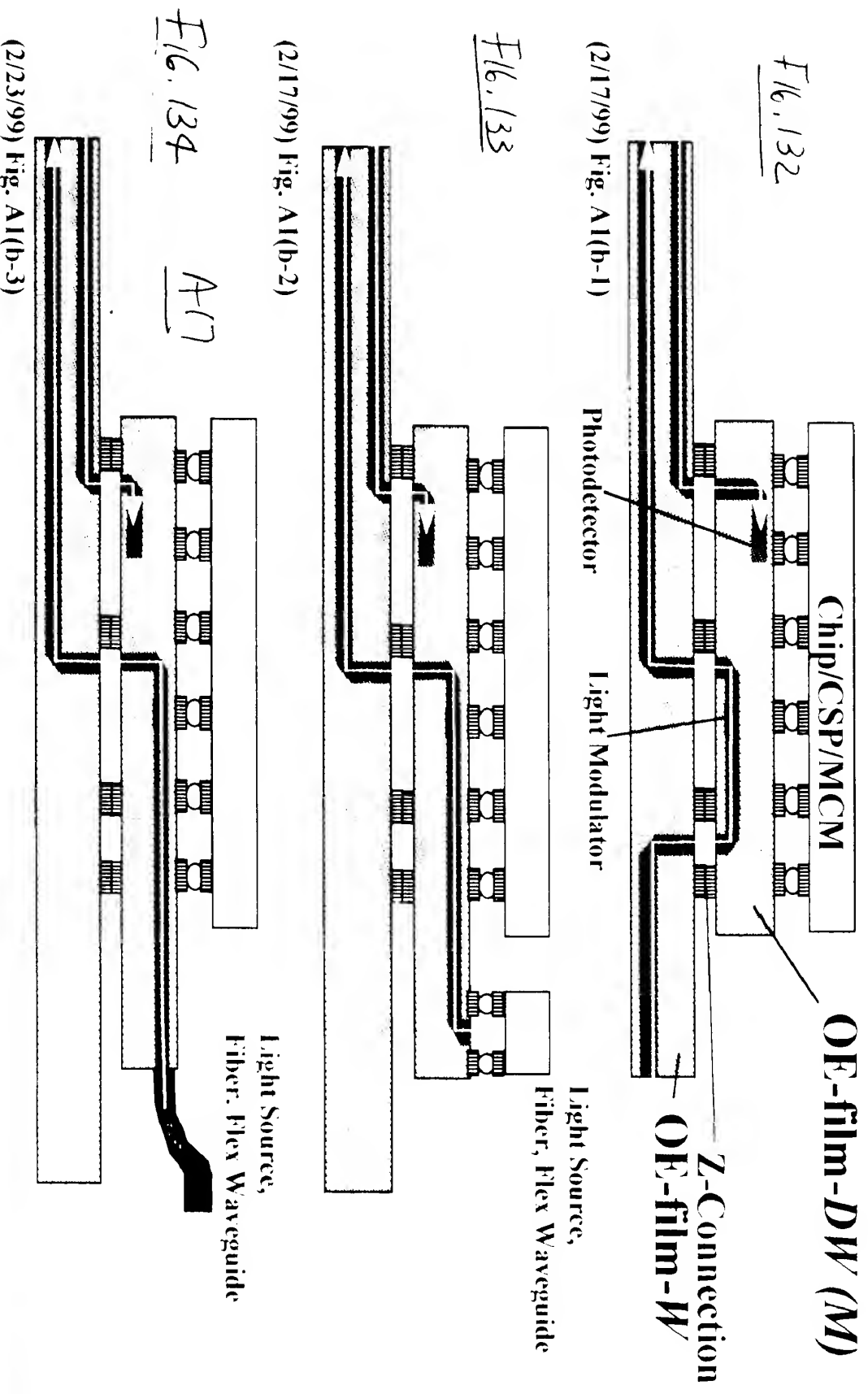
(2/23/99) Fig. New-A1-Modified

Figure 5

A15 3/7/99 --

Fig. 131

OE-film: Light Modulator Transmitters



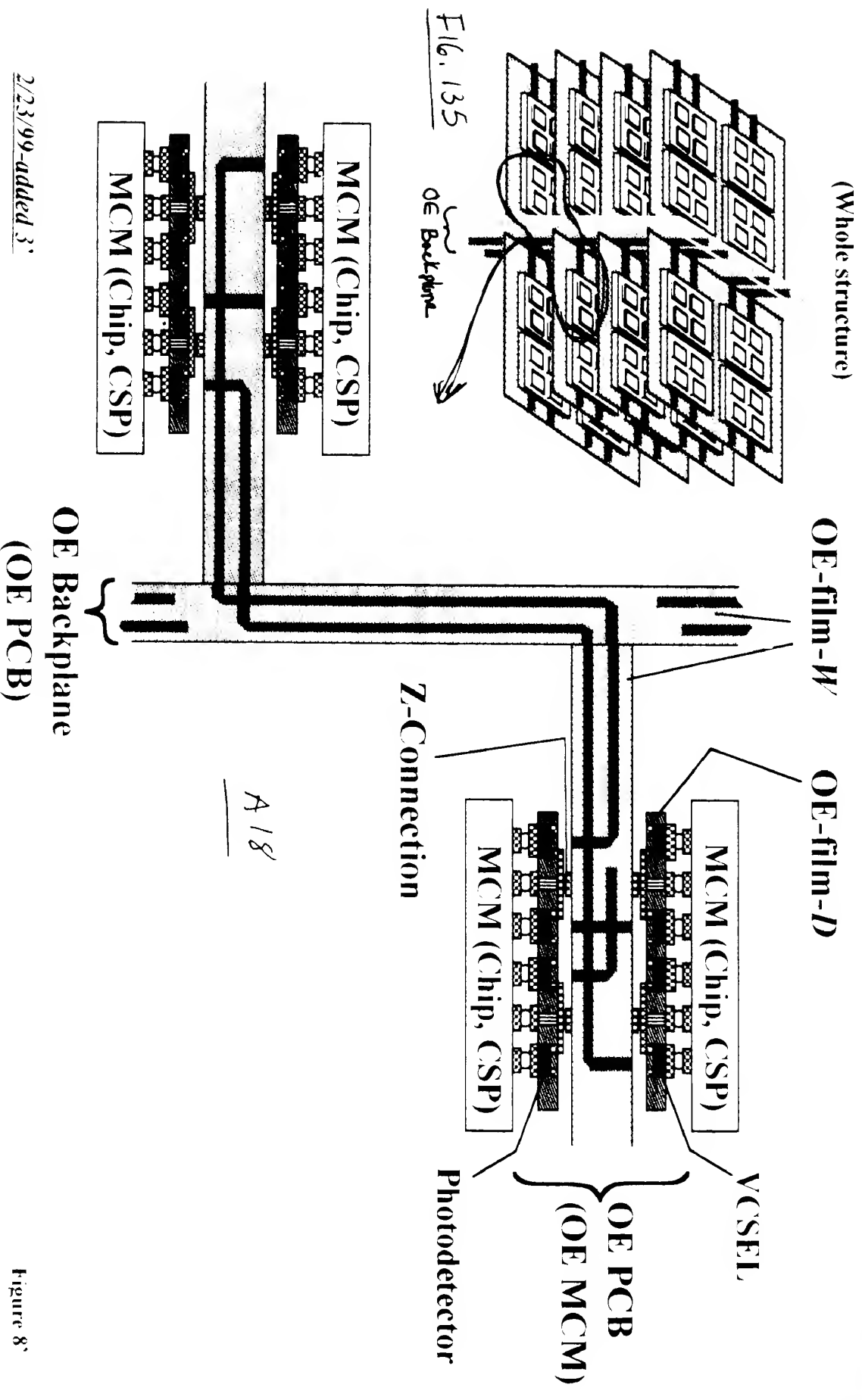
Examples of Light Modulators: Electro-Optic (EO) Modulator, Electro-Absorption (EA) Modulator

Figure 7

A17 3/7/99

A1

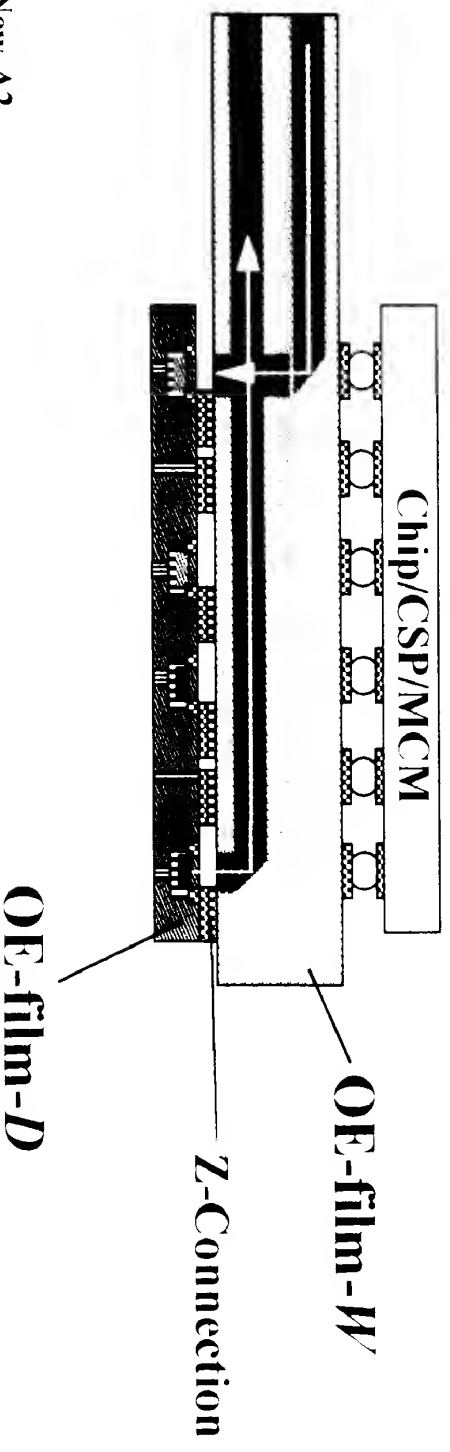
OE-film: Both-Side Packaging



2/23/99-added 3'

Figure 8'

OE IP is Placed on the Opposit Side



(2/23/99) Fig. New-A2

Flc.138

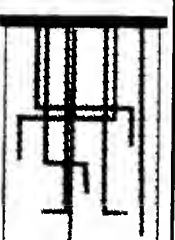
A20

Figure 10

A20 3/7/99

11231

Direct Jump from LSI



Can act as
Line length controller

Fiber Ribbon

Film Waveguide with Device Integration

Fig. 136

Connector

VCSEL

Photodiode

LSI

LSI

MCM

Electrical Board

Z-Connection

Fig. 137

Fig. New-A4-Modified

Photodetector

A4

Light Modulator

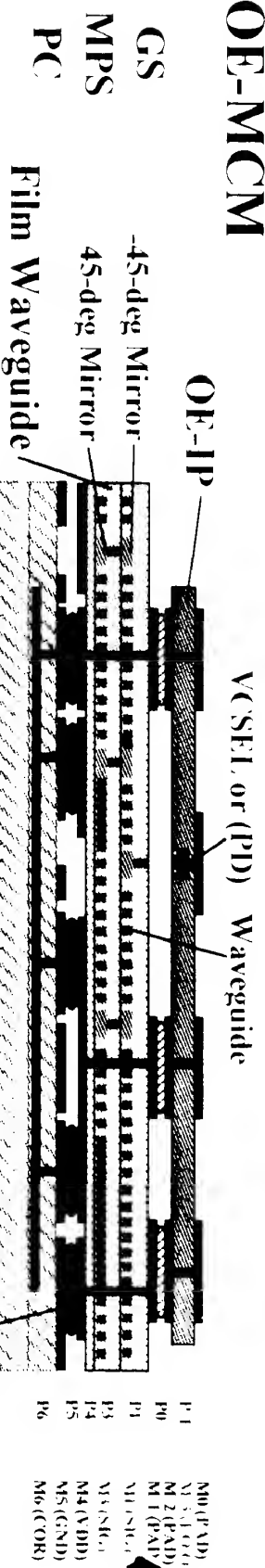
Z-Connection



A4 1/18/99

OE MCM

OE-MCM



F16.139



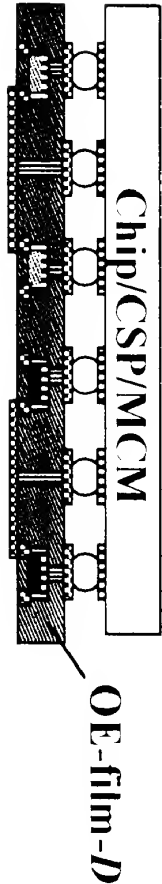
F16.140

Fig. A5-Modfitec

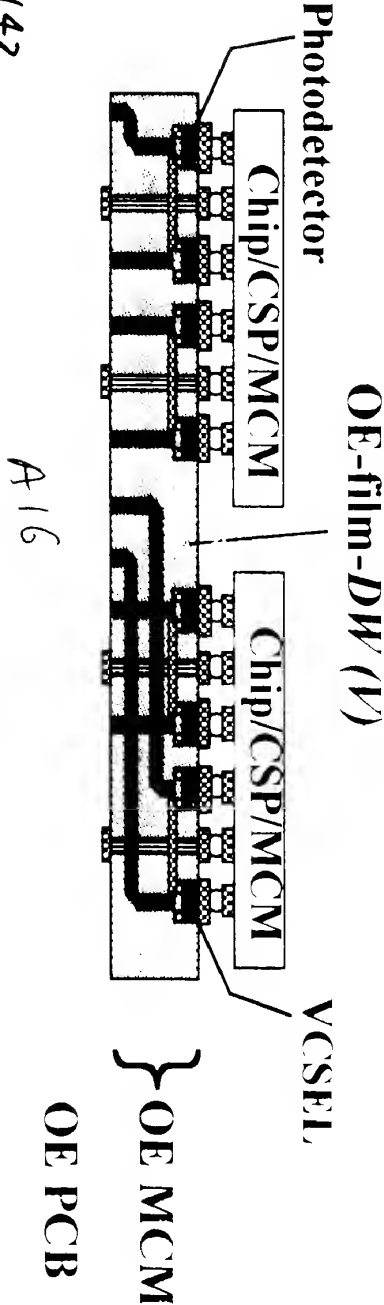
A5 1/18/99

A5

OE-film: Smart Pixel



Flg. 141



Flg. 142

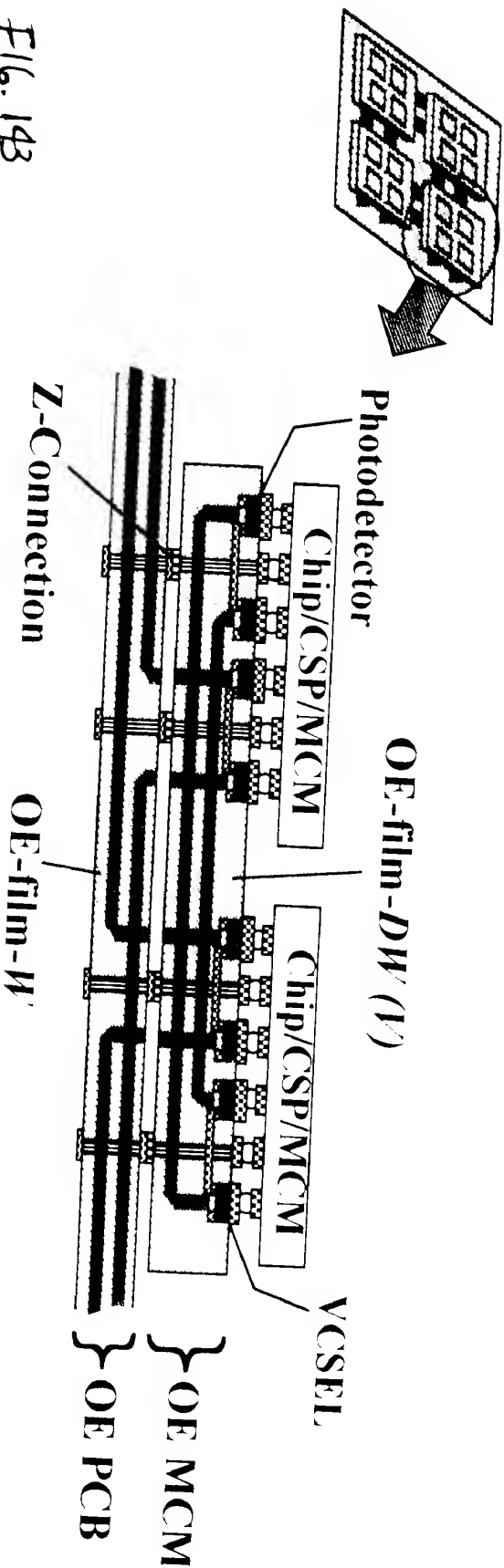
A16

2/23/99-added 6'

A16 3/7/99

Figure 6'

OE-Film/OE-Film Stack --- Back-Side Connection FCPT



File. 143

A19

2/23/99-added 4'

Figure 9'

A19 3/7/99

OE-Film/OE-Film Stack --- Back-Side Connection

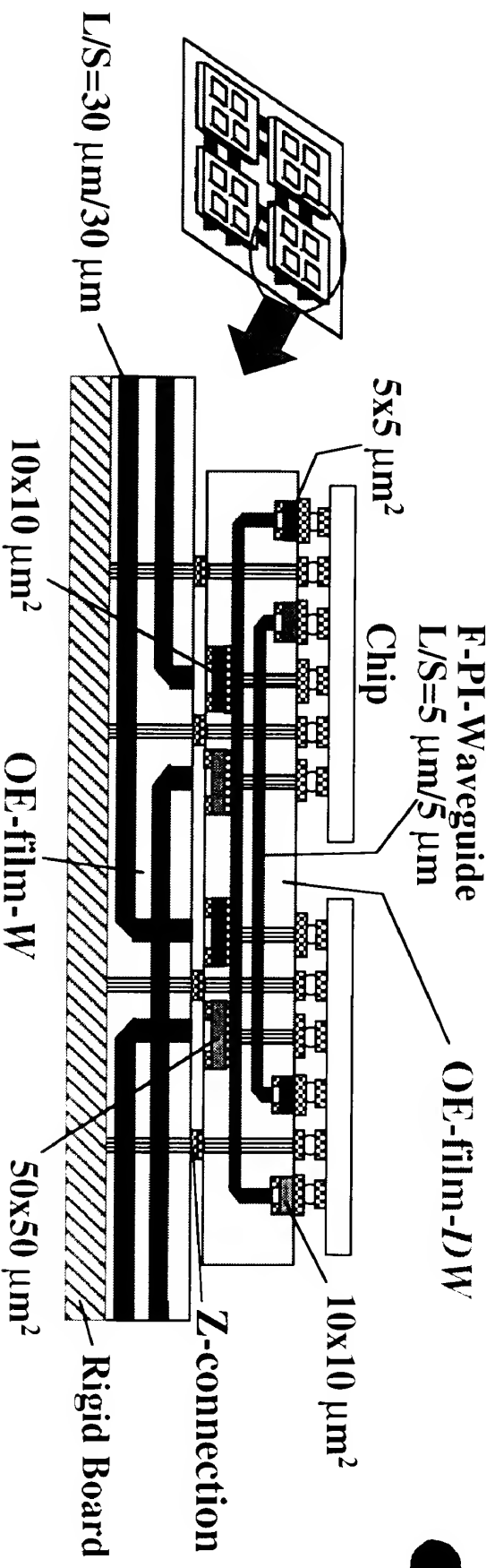


Fig. 3/18/99-1

4/2

F16.144

D1 3/18/99

OE-MCM/OE-Bord Stack

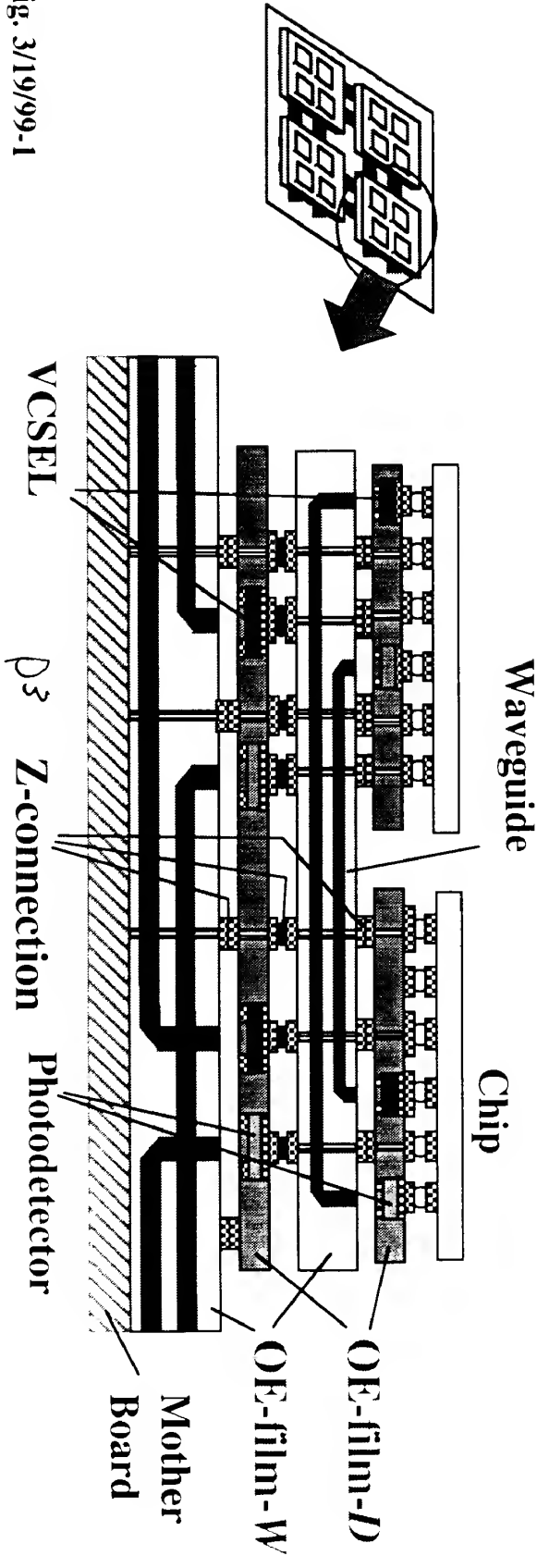
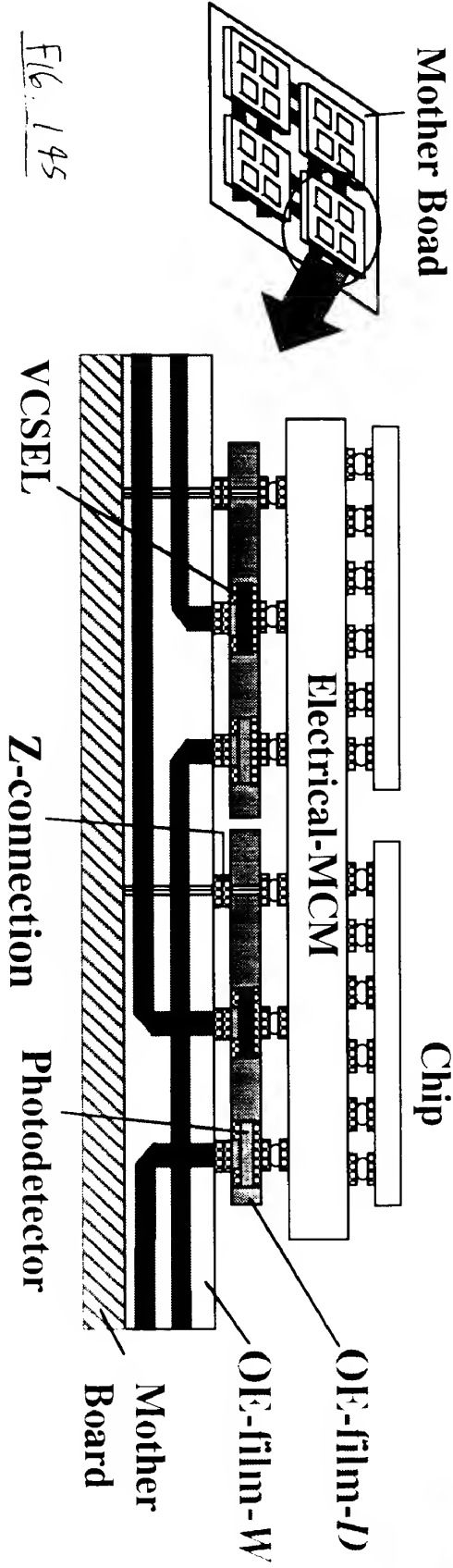


Fig. 146

03 3/18/99

Device Integration Process

(1) Pads/Lines formation



Fig. 147

(2) Placement of Thin-film devices



Fig. 148

(3) Polymer coat



Fig. 149

(4) Planarization



Fig. 150

(5) Vias/Pads/Lines formation



Fig. 151

(6) Substrate removal



Fig. 152

OE-film-D

A21

(6') Jump to the waveguide formation process



Fig. 153

OE-film-DW(V)